2001

Wisconsin Inpatient Hospital Quality Indicators Report

Bureau of Health Information
Division of Health Care Financing
Wisconsin Department of Health and Family Services

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FOREWORD

In 2001 there were more than 650,000 hospitalizations in Wisconsin, accounting for nearly $7.5 billion in health care charges.[1] In addition to information about health care costs, consumers, payers, providers and policy makers want more information about quality. Recent national publications have drawn attention to the quality of care in hospitals in particular. This first annual Wisconsin Inpatient Hospital Quality Indicators Report is intended to provide information about the quality of care in Wisconsin hospitals. Publication of this report is mandated by HFS 120 of the Wisconsin Administrative Code.

Hospitals use information to make administrative and system changes that will improve patient outcomes. Generally, hospitals have information about their own performance but lack comparative information or benchmarks. The Wisconsin Inpatient Quality Indicators Report permits hospitals to view their performance in comparison to their peers. In addition, information about care quality allows consumers and payers to make informed health care choices.

This report has many potential audiences and uses. For example, it:

- Allows Wisconsin hospitals to compare their performance against their peers.
- Provides information about performance variation among Wisconsin hospitals.
- May help guide quality improvement efforts.
- Provides health care consumers, payers, providers and policy makers with useful information about the overall quality of care in Wisconsin hospitals.
- Provides a resource to consumers interested in learning about the expected outcomes of hospital care associated with specific diagnostic categories and procedures.

The quality indicators included in this report were developed by the Agency for Healthcare Research and Quality (AHRQ). AHRQ is the U.S. Department of Health and Human Services agency designated by the U.S. Congress to publish the first national report on health care quality. That report was released in late 2003.

The quality measures for this report were derived from hospital data submitted to the Bureau of Health Information in the Wisconsin Department of Health and Family Services by 127 general medical and surgical hospitals in the state for 2001 inpatient stays. Chapter 153, Wisconsin Statutes, requires hospitals to submit administrative and claims (billing) information which includes patient demographic information, patient discharge diagnoses, procedures conducted during the hospital stay, length of the hospital stay, discharge disposition and hospital charges.

This report was prepared in the Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services. Sandra Mahkorn, MD, MPH, MS, Chief Medical Officer for the Division of Health Care Financing, and Anne Ziege, PhD, of the Bureau

[1] *Wisconsin Health Care Data Report,* 2001. Department of Health and Family Services, Division of Health Care Financing, Bureau of Health Information.

of Health Information, analyzed the data and wrote the report. An external workgroup of hospitals, payers, and other stakeholders (see page 3) provided guidance on selection of the indicators used in the report. The Board on Health Care Information reviewed a draft of the report and provided comments.

This report is available online from the Department of Health and Family Services Web site at the following Web address: http://dhfs.wisconsin.gov/provider/hospitals.htm.

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TABLE OF CONTENTS

INTRODUCTION

Over one-third of personal health care expenditures in the United States are for hospital care. In Wisconsin in 2001, there were nearly 650,000 inpatient hospital stays generating almost $7.5 billion in health care charges. Consumers, payers, providers and policy makers are interested in knowing more about the quality of care they receive in a hospital setting. Informed consumers can make better health care choices. There are many formal and informal sources of information about quality. Recommendations from physicians and other providers, experiences of friends and family, and quality reports that provide information about the process and outcomes of care are all important in making health care decisions.

Despite widespread interest in information about quality in a health care setting, determining methods to best assess quality of hospital care is a challenge. Definitions of quality differ; human beings are physically, emotionally and psychologically complex; data are imperfect; and the source of information that best reflects quality is controversial.

This Wisconsin Hospital Inpatient Quality Indicators Report presents useful information about the quality of inpatient care delivered in Wisconsin hospitals in 2001. Nineteen hospital quality indicators are included in this report. These indicators were constructed using administrative and billing (claims) data from hospital discharges in Wisconsin. Administrative and claims data are collected by the Bureau of Health Information in the Department of Health and Family Services pursuant to Chapter 153, Wisconsin Statutes. HFS 120, Wisconsin Administrative Code, charges the Department with the production of an inpatient hospital quality indicators report that:

- Is consistent with nationally recognized indicators of quality;
- Displays quality indicator variation across Wisconsin hospitals;
- Protects the anonymity of individual hospitals;
- Provides hospitals with useful information for internal quality improvement.

Hospital discharge administrative and claims data include information about patient demographics, diagnoses that are known and reported at the time of discharge, procedures performed during the hospitalization, length of the hospital stay, discharge disposition and hospital charges.

Indicators of Quality, Not Definitive Determinations of Quality

Even though these inpatient hospital quality indicators represent the state-of-the-art in measuring the quality of hospital care through analysis of administrative and claims data, it is important to recognize that these are **indicators** of quality and **not definitive determinations** of quality. For example, different mortality rates among hospitals may reflect differences in coding, differences in care, differences in practice patterns or differences in patient risk factors not included in administrative and claims data. These indicators are meant to serve as a starting point for further investigation that employs more in-depth analyses. It is important to keep in mind that administrative and claims data do not contain the more detailed patient information typically available from clinical medical records.

The U.S. Agency for Healthcare Research and Quality (AHRQ) describes the indicators presented in this report as "useful additions to the 'tool kit' for clinical quality professionals, health care managers, health policy makers, as well as researchers." [2] In particular, the information contained in this report should be useful for hospital administrators, hospital physicians, hospital quality managers and anyone actively engaged in hospital quality improvement initiatives. Variations in results among the hospitals included in this report may stimulate further analysis of the reasons for these differences and contribute to the quality efforts already underway in Wisconsin hospitals.

The information in this report provides a foundation for further analysis of care quality. In some cases, variation in quality indicator results represents true differences in quality. In other cases differences in results may reflect coding differences or the limitations of risk adjustment based on the information available in claims data. Variation in hospital performance may actually reflect the practice patterns of individual providers and not the hospital as a whole. For example, high numbers of Cesarean sections at one hospital may be attributed to a single doctor. Variation may also reflect inadequate risk adjustment (especially risks not captured by claims data) or a series of systemic differences between hospitals. In sum, the information presented in this report provides a "snapshot" of comparative data to direct the continuous inquiry that is the foundation of hospital quality improvement efforts.

[2] "Refinement of the HCUP Quality Indicators"; Technical Review 4. AHRQ Publication No. 01-0035. May 2001.

THE WISCONSIN INPATIENT HOSPITAL QUALITY INDICATORS REPORT

The Wisconsin Inpatient Hospital Quality Indicators Report provides information about procedure volume, utilization and in-hospital mortality for common conditions and procedures in 127 general medical and surgical hospitals in Wisconsin. Federal hospitals are not included in this report. Data used to construct the 19 quality indicators in this document are derived from administrative and claims (billing) data submitted to the Bureau of Health Information in the Department of Health and Family Services under Chapter 153, Wisconsin Statutes. These 19 indicators are a subset of the 31 Hospital Quality Indicators developed by the Agency for Health Research and Quality (AHRQ) with the assistance of the University of California San Francisco-Stanford Evidence-Based Practice Center. The AHRQ indicators are supported by research and technical review performed by the UCSF-Stanford EPC.

QUALITY INDICATORS WORKGROUP

To provide guidance for this report, the Bureau of Health Information convened a Quality Indicators Workgroup. Seventeen individuals, representing employers, payers, clinics, hospitals, health plans, physicians, public health and consumers, provided guidance for the construction of this report (See Appendix A). The workgroup met monthly from June 2002 until May 2003. The Workgroup discussed hospital coding variation, strengths and limitations of indicators, suggestions for inclusion or exclusion of specific indicators, options for graphic presentation of indicators, guidance for public interpretation and the usefulness of the report.

In addition, the Quality Indicators Workgroup proposed a set of criteria, shown below, for the inclusion of indicators in this report. As a result of the application of these criteria, 12 of the 31 AHRQ indicators were eliminated from the 2001 report. The criteria for inclusion/exclusion of indicators included:

- **The indicators should be hospital-specific.** Area-level utilization indicators (see Appendix G for a complete list of the AHRQ indicators) were excluded from this report because its focus is at the hospital level rather than the state as a whole or some other geographical area. Indicators defined as area-level by AHRQ are calculated only at levels of aggregation larger than individual hospitals, such as metropolitan statistical areas and states. An example of an area-level utilization indicator is the hysterectomy rate in Wisconsin for all women 18 years of age and older.

- **Indicators related to procedures frequently performed in an outpatient setting should be excluded.** Much of the data needed to construct meaningful quality indicator scores are not included in the hospital inpatient database for procedures that are frequently performed in an outpatient setting. For example, the "utilization" indicator for laparoscopic cholecystectomy is constructed using laparoscopic cholecystectomies and abdominal cholecystectomies. Since most laparoscopic procedures are performed in outpatient settings, they would not be captured by the AHRQ quality indicator specifications.

- **Indicators affected by changes in guidelines, or lack of consensus for guidelines, should be excluded.** If there is recent clinical evidence that suggests the indicator may no longer be

clinically appropriate as a quality indicator, that indicator was eliminated. For example, there is recent medical literature suggesting that Vaginal Birth After C-Section (VBAC) may be associated with more complications than previously recognized. Therefore, judgments about better or worse hospital performance on this indicator may be confusing and controversial. The rate of VBAC was consequently excluded from the 2001 report.

- **Indicators for procedures where the denominator, or total number of procedures, is extremely small should be excluded.** The denominator size needed to calculate a reliable mortality rate was not present at any Wisconsin hospitals for some procedures. A minimum of 50 cases is necessary to calculate a mortality rate for a specific procedure or condition. Esophageal resection, for example, is a relatively rare procedure, and no Wisconsin hospitals performed enough of these procedures to calculate a reliable mortality rate. Consequently, mortality rates for esophageal resection are excluded from the 2001 report.
- **Indicators for procedures performed at few hospitals in Wisconsin should be excluded.** For example, the indicators for pediatric heart surgery are excluded because so few hospitals perform the procedure that maintaining hospital anonymity was not possible.

The workgroup also discussed several options for addressing at least some of the 11 eliminated indicators in future reports. For example, mortality rates for rare procedures, such as esophageal resection, might be calculated if several years of data were combined. It is fully anticipated that the content of this report will change in subsequent years as refinements continue to be made to these indicators and as clinical evidence regarding these indicators evolves.

AUDIENCE AND USES

Audience(s)

The Wisconsin Inpatient Hospital Quality Indicators Report is intended for payers, providers, consumers and policymakers. It offers a window into the quality of care delivered in Wisconsin hospitals.

Potential Uses

Examples of potential uses for the Wisconsin Inpatient Hospital Quality Indicators Report include:

- To provide an indication of hospital quality at the state level.
- To indicate the degree of variation in utilization, procedure volume and in-hospital mortality among hospitals in Wisconsin.
- To allow hospitals to assess their performance against their peers.
- To provide hospitals with information that will allow them to perform more in-depth internal quality investigations and complement their ongoing quality improvement efforts.
- To provide a resource to consumers interested in learning about the expected outcomes of hospital care associated with specific diagnostic categories and procedures.

- To compare Wisconsin hospital quality indicators with national indicators that employ the same methodology, as those results become available. (It is anticipated that AHRQ will provide comparable nationwide results in the future.)
- For cross-state comparisons of quality as data become available from other states using this methodology.
- To monitor changes in quality indicator scores over time.
- To guide further analyses of quality by providers, payers and policymakers.

Caveats

The Wisconsin Inpatient Hospital Quality Indicators Report provides **indicators** of hospital quality, **not definitive determinations** of quality. More definitive determinations of quality depend on further, more in-depth, analyses.

It is *not* appropriate to compare the indicator results in this report with any other similar indicators, absent assurance that the methods of constructing indicators exactly replicate those of the AHRQ inpatient indicators. For example, a report referring to mortality rates following coronary artery bypass surgery (CABG) may refer to 30-day mortality and would thus not be comparable to the inpatient mortality for CABG reported here. Another report may use different CPT or ICD-9-CM codes to identify procedures or conditions, or a different risk adjustment methodology, making comparisons misleading and inappropriate.

DATA AND REPORTING ISSUES

Why Hospitals Are Not Identified In This Report

Based on the recommendations of the UCSF-Stanford EPC, which provided the analysis for hospital quality indicator development, AHRQ discourages the public reporting of indicators by individual hospital. In addition, HFS 120, Wisconsin Administrative Code, prohibits the identification of individual hospitals while encouraging the presentation of data in a way that provides insight into variation in quality scores among facilities. This report indicates the variation among hospitals, but does not identify hospitals.

While the AHRQ hospital quality indicators represent the current state-of-the-art in quality assessment using administrative and claims data, AHRQ recommends that these indicators be cautiously interpreted and used, given the inherent limitations of the data from which they are constructed. These indicators are appropriate for internal quality improvement efforts, but are not intended for informing purchasing decisions or for sanctioning individual institutions. Instead, these measures are most appropriately thought of as a starting point for further investigation. Indicator results are imperfect, at best, and should be used as a screening tool rather than as definitive measures of hospital quality.[3] Identifying variation in performance and indicator results is useful for directing the quality improvement priorities and activities of providers, payers and policy makers.

[3] A different set of limitations is associated with use of medical chart data to assess hospital quality.

Data Advantages and Limitations

Administrative data are primarily used for billing purposes. However, such data also contain valuable information about patient diagnoses, procedures performed during the hospitalization, length of stay, charges, disposition of the patient and demographic information about the patient. Further, administrative data are generally much easier to obtain than information from the inpatient medical record, and many hospitals regularly report them to local and national organizations. Consequently, they are widely accessible.

Administrative and claims data do, however, have limitations. Awareness of these limitations is critical to accurate interpretation of the quality indicators presented in this report. These limitations include:

1. Systematic variation and errors in the coding of diagnoses and procedures.
2. Inability to determine whether a condition reported on the hospital discharge database occurred during the hospital stay or preceded hospital admission.
3. Lack of specificity in ICD-9-CM coding.
4. Limitations of data content: administrative data do not contain the detailed patient information found in clinical medical records.

AHRQ INPATIENT QUALITY INDICATORS

Overview of AHRQ Indicators

The AHRQ hospital quality indicators were developed for use as a quality screening tool, or for first examination of potential hospital quality problems (AHRQ Technical Review 4: "Refinement of the HCUP Quality Indicators," Executive Summary, 2001).

AHRQ divides the indicators into four areas: **volume, utilization, mortality for procedures, and mortality for conditions.** Indicators for all four areas make use of readily available hospital inpatient administrative data. In addition, the indicators related to mortality incorporate risk adjustment, which uses administrative data to address biases that may arise from differences in patient mix severity across providers. Risk-adjusted mortality rates are superior to unadjusted rates and more fair to providers with severe and complex patient mixes; however, unmeasured differences in patient mix may still influence mortality rates.

Methods Used in Indicator Selection and Refinement

As described in Appendix B, the AHRQ hospital quality indicators were selected and refined by the staff of the University of California-San Francisco Evidence-based Practice Center. Potential indicators were identified through strategic literature searches and evaluated on the basis of reliability and validity, precision, minimization of bias, relationship to real quality improvement and prior effective use as quality indicators. Selection for evaluation required (for all indicators):

- Indicators are compatible with the use of HCUP data (see Appendix B).

- Conditions addressed affect at least 1 percent of hospitalized patients or 20 percent of providers.
- Conditions are the subject of public reporting, previous use as indicators or large dollar volume.
- Indicators show a clear relationship to quality as evaluated by clinical judgment of health services researchers and medical doctors (AHRQ Technical Review 4, 2001).

Volume (Hospital-Level) Indicators

The volume indicators are simple counts of admissions in which specific procedures were performed during the hospital stay. Two additional evaluation criteria were applied to the selection of volume indicators:

1. A widely documented volume-outcome relationship; and

2. Recent evidence regarding a volume-outcome relationship.

The AHRQ Quality Indicators documentation cites studies suggesting a relationship between procedure volume and outcome, specifically that higher volume is associated with better outcomes. The link between volume and outcome remains controversial, however, and no consensus exists on the exact thresholds that define high volumes. The "California Report on Coronary Artery Bypass Graft Surgery," for example, documented no apparent relationship between volume and outcome, and cautioned about the imprecision of rates for hospitals with small numbers of procedures.[4]

The volume thresholds shown in Table 1 are the lowest and highest found in the volume-outcome literature reviewed by AHRQ in developing the indicators (see Appendix D for literature citations associated with thresholds). Following AHRQ's suggestion, hospitals exceeding these thresholds are defined as high-volume in this report. It should be kept in mind, however, that evidence regarding the volume-outcome relationship is inconsistent.

Table 1. Volume Indicators and Thresholds

Indicator	Thresholds	Comment
Abdominal Aortic Aneurysm Repair	10 procedures 32 procedures	Relatively rare procedure.
Carotid Endarterectomy	50 procedures 101 procedures	
Coronary Artery Bypass Graft (CABG)	100 procedures 200 procedures	
Esophageal Resection	6 procedures 7 procedures	Relatively rare procedure.

[4] Damberg, C.L., R.E. Chung and A. Steimle. 2001. "The California Report on Coronary Artery Bypass Graft Surgery: 1997-1998 Hospital Data, Summary Report." Pacific Business Group on Health and the California Office of Statewide Health Planning and Development. San Francisco CA.

Table 1. Volume Indicators and Thresholds

Indicator	Thresholds	Comment
Pancreatic Resection	10 procedures 11 procedures	Relatively rare procedure.
Percutaneous Transluminal Coronary Angioplasty (PTCA)	200 procedures 400 procedures	Increasingly an outpatient procedure.

Utilization (Hospital-Level) Indicators

Utilization indicators represent procedures "whose use varies significantly across hospitals, and for which high or low rates of use are likely to represent inappropriate or inefficient delivery of care, leading to worse outcomes, higher costs or both." (AHRQ Technical Review 4, 2001.)

Utilization indicators were required to have an alternative surgical or medical therapy with lower/higher morbidity or mortality – in addition to meeting the other criteria noted above – in order to be selected for evaluation.

Table 2. Utilization Indicators

Indicator	Definition	Comment
Cesarean Section Delivery Rate	Number of Cesarean sections per 100 deliveries.	C-section has been identified as an over-used procedure. Lower rates suggest better quality care.
Rate of Incidental Appendectomy Among the Elderly	Number of incidental appendectomies per 100 elderly discharges with intra-abdominal procedure.	Incidental appendectomy is not indicated for elderly patients. Lower rates suggest better quality care.

Mortality Indictors for Surgical Procedures and Medical Conditions

The AHRQ mortality rates reflect the inpatient death rate for several complex procedures and conditions. The mortality indicators presented here are risk-adjusted, using software recommended by AHRQ, to account for some of the differences in patient mix across providers. Risk adjustment uses statistical procedures to account for the effects of patient-specific factors such as age, sex and secondary diagnoses. Such factors are considered to lie outside the control of hospitals and providers while still influencing medical and surgical outcomes.

Eleven mortality indicators are included in this report. We exclude procedure-related indicators where: a) the number of procedures is too small across a majority of hospitals to compute reliable rates of mortality, or b) the number of hospitals performing a procedure is very small, thereby making the hospitals easily identifiable.

Table 3. Mortality Indicators for Procedures

Indicator	Definition
Coronary Artery Bypass Graft (CABG) Mortality Rate	Number of in-hospital deaths per 100 discharges for CABG, age 40 and older.
Hip Replacement Mortality Rate	Number of in-hospital deaths per 100 discharges for partial or full hip replacement.
Percutaneous Transluminal Coronary Angioplasty (PTCA) Mortality Rate	Number of in-hospital deaths per 100 discharges for PTCA.
Carotid Endarterectomy Mortality Rate	Number of in-hospital deaths per 100 discharges for carotid endarterectomy.
Craniotomy Mortality Rate	Number of in-hospital deaths per 100 discharges for craniotomy.

Table 4. Mortality Indicators for Conditions

Indicator	Definition
Acute Myocardial Infarction (AMI) Mortality Rate	Number of in-hospital deaths per 100 discharges for AMI, any diagnosis field.
Congestive Heart Failure (CHF) Mortality Rate	Number of in-hospital deaths per 100 discharges with principal diagnosis of CHF.
Acute Stroke Mortality Rate	Number of in-hospital deaths per 100 discharges with principal diagnosis of stroke.
Gastrointestinal (GI) Hemorrhage Mortality Rate	Number of in-hospital deaths per 100 discharges with principal diagnosis of GI hemorrhage.
Hip Fracture Mortality Rate	Number of in-hospital deaths per 100 discharges with principal diagnosis of hip fracture.
Pneumonia Mortality Rate	Number of in-hospital deaths per 100 discharges with principal diagnosis of pneumonia.

QUALITY INDICATOR MEASURES – WISCONSIN HOSPITALS, 2001

This report presents results using 2001 data on 19 hospital inpatient quality indicators for 127 general medical and surgical hospitals in Wisconsin. The 19 indicators are a subset of 31 "Inpatient Quality Indicators" developed by the Agency for Health Research and Quality (AHRQ). For a complete list of the 31 AHRQ inpatient indicators, see Appendix G.

AHRQ identified four types of inpatient indicators:

- ✓ Volume
- ✓ Utilization
- ✓ Mortality associated with procedures
- ✓ Mortality associated with conditions

The indicators included here were constructed from administrative and claims data submitted to the Bureau of Health Information in the Wisconsin Department of Health and Family Services. Production of these measures is consistent with specifications provided by AHRQ (see previous section and Appendix F, Methodology).

Presentation of Indicators

Volume, utilization and mortality indicators presented in this section are organized by organ system, disease and type of admission. Table 5 (next page) illustrates the order in which quality indicators appear in this report and the types of indicators associated with each procedure or condition.

Interpreting the Indicator Results

As discussed earlier in this report, it is important to note that these are **indicators** of quality and **not definitive determinations** of quality. They are intended for use as a starting point in quality investigations.

For example, there are many reasons a hospital might have a higher inpatient mortality rate for a given procedure in comparison to other hospitals. Some reasons might be related to quality of care, while others may not. Coding differences, the ability to discharge dying patients to hospice or skilled nursing facilities, or the limitations of information available for risk adjustment could contribute to, or account for, the variation in in-hospital mortality rates.

The Division of Health Care Financing will provide individual hospitals with their own indicator results for 2001 upon request. Hospitals may use their results to examine variation and determine whether true quality-of-care concerns exist. Follow-up investigation of variation might involve evaluation of population differences, profiling of providers associated with the hospital, examination of coding practices and medical record review.

Table 5. Hospital Inpatient Quality Indicators by Type

Procedure or Diagnosis	Volume	Utilization	Mortality with Procedure	Mortality with Condition
Circulatory System: Heart Disease, Stroke and Blood Vessel Disease				
Acute Myocardial Infarction (AMI)				**X**
Coronary Artery Bypass Graft Surgery (CABG)	**X**		**X**	
Percutaneous Transluminal Coronary Angioplasty (PTCA)	**X**		**X**	
Congestive Heart Failure (CHF)				**X**
Stroke				**X**
Carotid Endarterectomy (CE)	**X**		**X**	
Abdominal Aortic Aneurysm (AAA) Repair	**X**			
Orthopedics				
Hip Fracture				**X**
Hip Replacement			**X**	
Cancer Surgery				
Esophageal Resection	**X**			
Pancreatic Resection	**X**			
Obstetrics				
Cesarean Section		**X**		
Common Acute Conditions Causing Inpatient Hospitalization				
Pneumonia				**X**
Gastrointestinal (GI) Hemorrhage				**X**
Other				
Craniotomy			**X**	
Incidental Appendectomy in the Elderly		**X**		

Volume Indicators/Volume-Outcome Relationship

- The literature supporting an association between volume and outcome is inconsistent. Hospitals performing greater numbers of procedures do not necessarily have better outcomes related to those procedures. Volume indicators may be helpful when there are no other indicators of quality.

- Even when volume-outcome relationships are observed, they may not persist over time. New technology associated with procedures and less steep "learning curves" may affect previously observed volume-outcome relationships.

In our analyses of the 2001 data, there was no apparent relationship between inpatient mortality and volume for the relevant procedures — CABG surgery, PTCA and carotid endarterectomy. As a test, we grouped hospitals using the high-volume thresholds identified by AHRQ and we found no differences in average risk-adjusted mortality rates by volume level. However, the relative imprecision of mortality rates calculated for low-volume hospitals – particularly those with fewer than 50 procedures–requires that the results be interpreted with caution.

Potential reasons for the lack of a volume-outcome relationship for these indicators include:

1. No volume-outcome relationship exists.
2. Inpatient mortality is not the best outcome to look at because some hospitals may discharge patients to hospice or a skilled nursing facility before death.
3. Mortality rates at hospitals performing small numbers of procedures have wide confidence intervals. Therefore, it is more difficult to draw conclusions about mortality rates for hospitals performing fewer procedures.
4. Many of the research studies used to determine volume thresholds rely on relatively old data. Because medical technology is changing so rapidly and because the "learning curve" for performing complex procedures may diminish with collective experience and new technology, volume-outcome relationships may decrease over time.

Utilization Indicators

Variation in utilization rates is sometimes used as an indicator of quality. Over-utilization, under-utilization and/or inappropriate utilization may reflect a problem with quality. Utilization of health care services is influenced by many factors, including access to care, provider practice patterns, patient preferences and reimbursement. It is generally unwise to draw conclusions about the quality of care based on utilization alone. However, in the absence of obvious differences in patient populations, variation in utilization rates may stimulate a more in-depth assessment of the causes of that variation.

Mortality Indicators

Users of this report must realize that many factors not related to quality of care may influence the inpatient mortality rates of individual hospitals. These include:

- Differences in the accuracy and completeness of coding, affecting the information from administrative data available for risk adjustment.
- Inherent constraints of administrative data for use in risk adjustment. For example, administrative data may indicate that a patient has congestive heart failure, but relevant clinical details (e.g., left ventricular ejection fraction) may not be included in the billing record.
- The ability of a hospital to discharge seriously ill and dying patients to hospice or another institutional setting.
- Varying levels of procedure acuity, which is not always apparent from claims data, and may affect outcome. For example, PTCA is increasingly performed in emergent situations.

The reader is cautioned that risk-adjusted mortality rates for hospitals with small numbers of cases of the relevant procedures and conditions should be interpreted with caution. Rates calculated on small numbers of cases have wide confidence intervals, indicating they are relatively imprecise and unreliable (See Appendix H).

Heart Disease, Stroke and Blood Vessel Disease

ACUTE MYOCARDIAL INFARCTION (AMI) – MORTALITY

Each year, more than one million people in the United States experience a heart attack (**acute myocardial infarction–AMI)**. Up to half of all heart attacks are fatal, and many victims never reach a hospital. Heart attacks occur when a blockage occurs in a coronary artery, which supplies oxygen-rich blood to the heart muscle. Coronary artery disease occurs when fatty material forms a plaque in a coronary artery resulting in decrease blood flow. Blood clots are more likely to form in narrowed coronary arteries. If a clot or blockage occurs, the oxygen-rich blood cannot reach the heart muscle (myocardium) and it dies or becomes infarcted. This is an **acute myocardial infarction (AMI).**

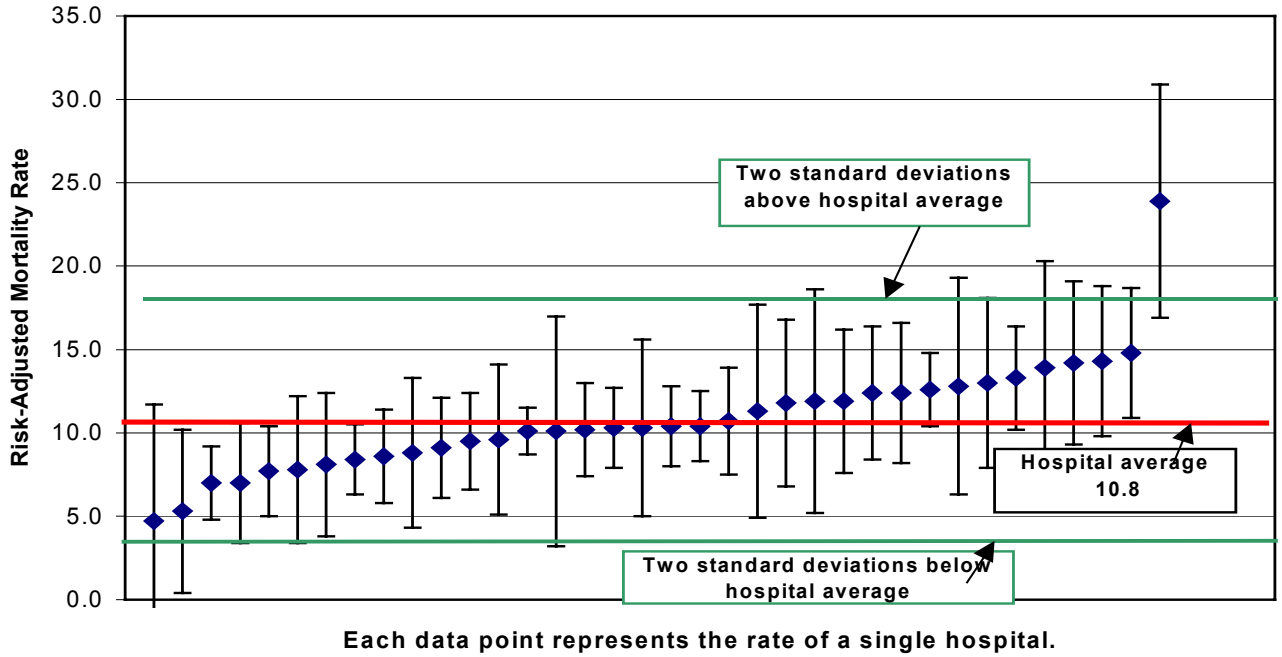
State-Level AMI Mortality

In 2001, the statewide, risk-adjusted, inpatient mortality rate for persons hospitalized with AMI was 10.4 per 100, or approximately 10 percent.

Hospital-Level AMI Mortality (Figure 1)

- Risk-adjusted inpatient mortality rates for AMI ranged from 4.7 to 23.9 per 100 cases among Wisconsin hospitals represented in this report. (Rates for hospitals with fewer than 50 AMI discharges in 2001 were excluded.)
- The average risk-adjusted inpatient mortality rate for the included hospitals was 10.8 per 100 cases.
- One hospital's rate was greater than 2 standard deviations above the hospital average.
- One hospital had a mortality rate significantly higher than the hospital average, based on a 95 percent confidence interval. Confidence interval width should be considered when interpreting this rate.

Figure 1. Acute Myocardial Infarction (AMI):
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with diagnosis code for AMI in any field)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

CORONARY ARTERY BYPASS GRAFT (CABG) SURGERY – VOLUME AND MORTALITY

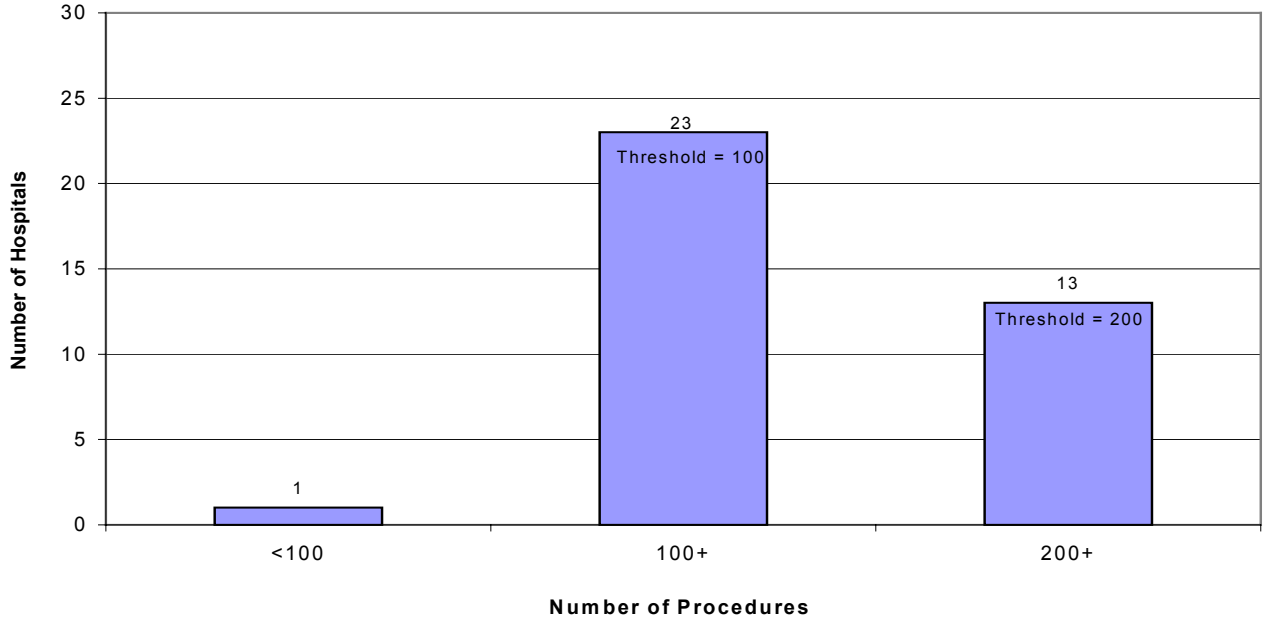
Coronary artery disease may be treated by medical and/or surgical procedures. Left untreated, persons with significant coronary artery disease have an increased risk of heart attack (acute myocardial infarction) or death. One treatment for coronary artery disease is **coronary artery bypass graft surgery (CABG)**. In this procedure veins from the legs or arteries going to the chest wall are attached to diseased coronary arteries to bypass the blocked or narrowed area. More than 500,000 CABG procedures are performed each year in the U.S.

AHRQ identified two high-volume thresholds for CABG surgery—100 and 200 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Ninety-eight percent of CABG surgeries in Wisconsin were performed at hospitals meeting the high-volume threshold of 100 procedures. Eighty percent were performed at hospitals meeting the high-volume threshold of 200 procedures.

CABG Surgery Volume (Figure 2)

- Twenty-four [5] Wisconsin hospitals performed CABG surgeries in 2001.
- Twenty-three of the 24 hospitals met the AHRQ high-volume threshold of 100 procedures.
- Thirteen hospitals also met the AHRQ high-volume threshold of 200 procedures.

Figure 2. Coronary Artery Bypass Graft (CABG): High-Volume Thresholds
Number of hospitals below and at/above high-volume thresholds identified by AHRQ



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

[5] One Wisconsin hospital performing CABG surgery first began admitting patients during the 2001 reporting year. Because that hospital could not contribute a full year of data, it is omitted from the CABG volume and mortality indicator.

State-Level CABG Mortality

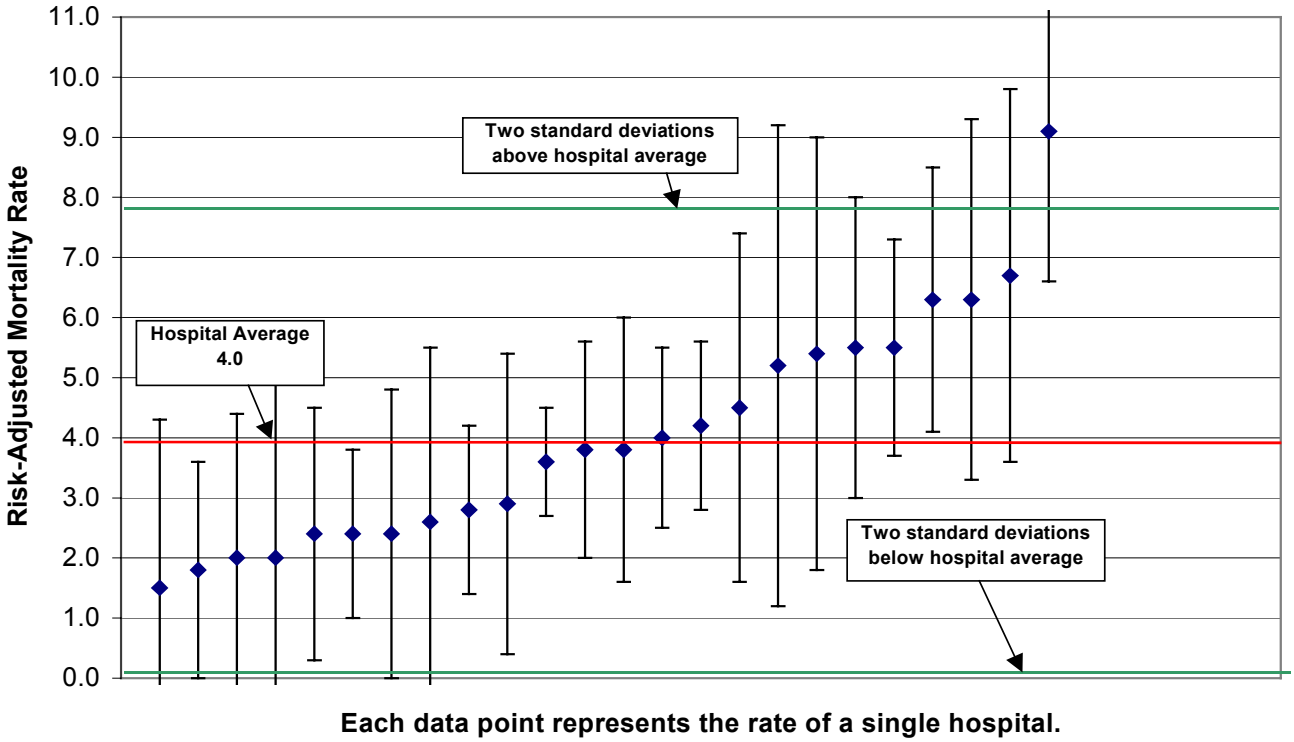
The Wisconsin statewide, risk-adjusted inpatient mortality rate for CABG surgery was 3.8 per 100 procedures, or approximately 4 percent.

Hospital-Level CABG Surgery Mortality (Figure 3)

- Risk-adjusted inpatient CABG mortality rates ranged from 1.5 to 9.1 per 100 procedures in 2001.
- The average risk-adjusted inpatient CABG mortality rate was 4.0 per 100 procedures, or approximate 4 percent.
- One hospital's rate was greater than two standard deviations above the average rate.
- Two hospitals had risk-adjusted mortality rates significantly higher than the hospital average, and two hospitals had rates significantly *lower* than the average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 3. Coronary Artery Bypass Graft (CABG):
Risk-Adjusted Mortality Rates with 95% Confidence Intervals

(Number of deaths per 100 discharges with procedure code for CABG in any field, age 40 years and older)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

PERCUTANEOUS TRANSLUMINAL CORONARY ANGIOPLASTY (PTCA) – VOLUME AND MORTALITY

Another treatment for coronary artery disease is **percutaneous transluminal coronary angioplasty (PTCA).** During coronary angioplasty, a catheter with a small, deflated balloon is inserted in a large artery (femoral artery) in the groin area. The catheter is guided through the body's major arteries until it reaches the coronary arteries. After the doctor identifies the blocked area with the help of a special x-ray and x-ray dye, the small balloon is inflated to open the blocked area. A small stent is usually placed in the area where the coronary artery has been widened to keep the blocked or narrowed area open.

PTCA Volume

More than 12,000 PTCAs were performed in inpatient settings in Wisconsin in 2001. It is important to note that another 800 PTCAs were performed in ambulatory care settings. **Procedures performed in ambulatory settings are not represented in this report.**

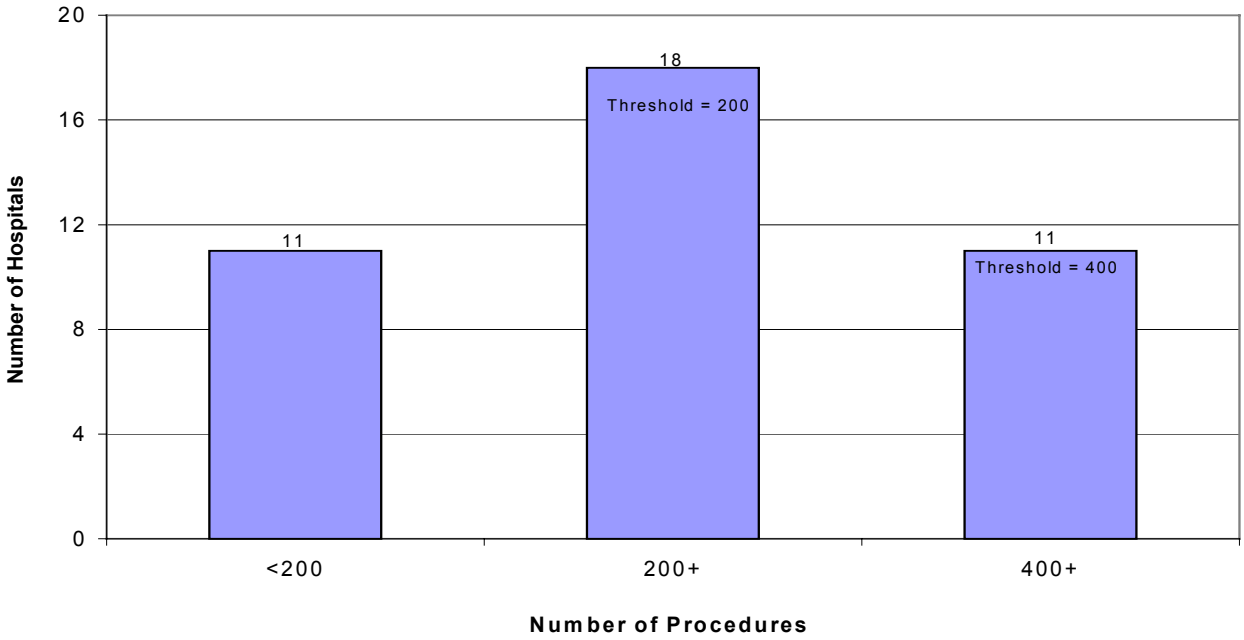
AHRQ identified two high-volume thresholds for PTCA—200 and 400 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Ninety-two percent of inpatient PTCAs in Wisconsin were performed at hospitals meeting the high-volume threshold of 200 procedures; 74 percent were performed at hospitals meeting the higher threshold of 400 procedures.

PTCA High-Volume Thresholds (Figure 4)

- Twenty-nine Wisconsin hospitals performed inpatient PTCAs in 2001. Eighteen of 29 hospitals met the AHRQ high-volume threshold of 200 procedures.
- Eleven of 29 Wisconsin hospitals met the AHRQ high-volume threshold of 400 procedures.

Figure 4. Percutaneous Transluminal Coronary Angioplasty: High-Volume Thresholds

Number of hospitals below and at/above high-volume thresholds identified by AHRQ



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

State-Level PTCA Mortality

The Wisconsin statewide risk-adjusted inpatient mortality rate for PTCA was 1.4 per 100 procedures, or approximately 1 percent.[6]

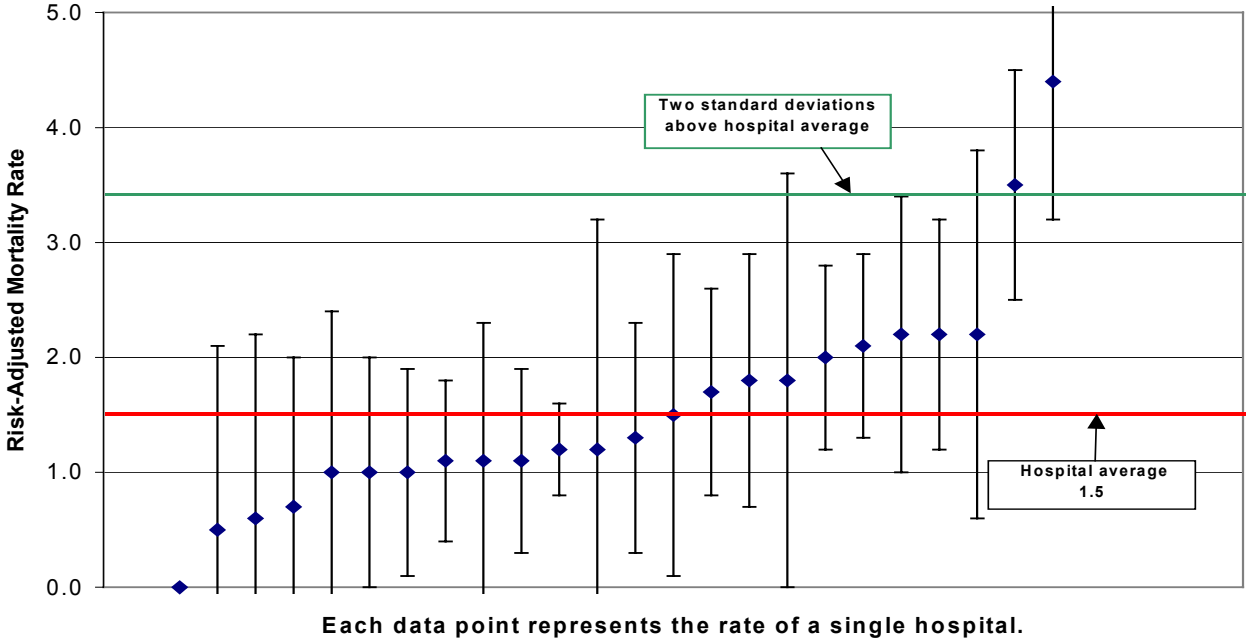
Hospital-Level PTCA Mortality (Figure 5)

- Risk-adjusted inpatient mortality rates among the Wisconsin hospitals included in this report ranged from 0 to 4.4 per 100 procedures. (Hospitals with fewer than 50 procedures were excluded.)
- The average risk-adjusted inpatient PTCA mortality rate for the 24 hospitals represented in this report was 1.5 per 100 procedures.
- Two hospitals had rates greater than two standard deviations above the hospital average.
- The same two hospitals had inpatient mortality rates significantly higher than the hospital average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

[6] It should be noted that a selection bias may exist at hospitals that perform outpatient PTCA or that refer a significant number of low-risk patients to outpatient surgery settings, which could affect inpatient PTCA mortality rates.

Figure 5. Percutaneous Transluminal Coronary Angioplasty (PTCA): Risk-Adjusted Mortality Rates with 95% Confidence Intervals

(Number of deaths per 100 discharges with procedure code for PTCA in any field)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

CONGESTIVE HEART FAILURE (CHF) – MORTALITY

Congestive heart failure affects approximately five million people in the U.S. It is a common cause of hospitalization, especially in persons over 65 years of age. Congestive heart failure is caused by uncontrolled high blood pressure, heart valve disease, and coronary artery disease leading to heart muscle damage, infection and other diseases of the heart muscle. Depending on the cause of the heart failure, there are a number of medical and surgical treatments for CHF, contributing to declining mortality rates for CHF.

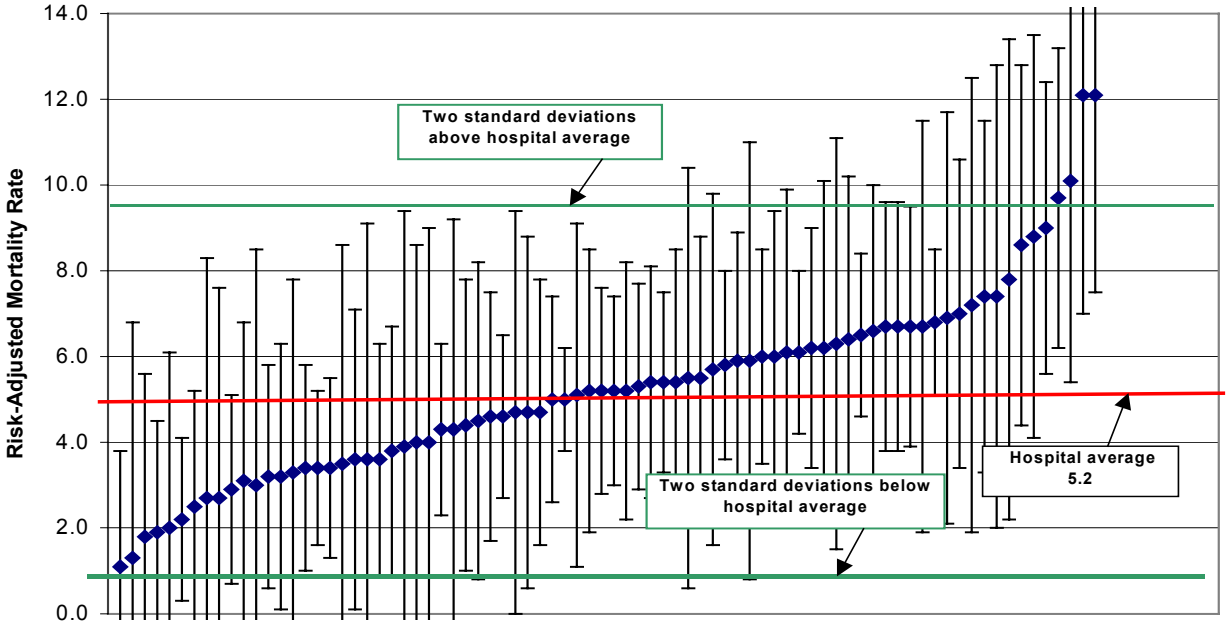
State-Level CHF Mortality

The Wisconsin statewide risk-adjusted inpatient mortality rate for persons hospitalized with CHF in 2001 was 4.9 per 100 cases, or approximately 5 percent.

Hospital-Level CHF Mortality (Figure 6)

- Risk-adjusted inpatient mortality rates for CHF ranged from 1.1 to 12.1 per 100 cases among the Wisconsin hospitals included in this report. (Rates for hospitals with fewer than 50 discharges associated with CHF were excluded).
- The average, risk-adjusted, inpatient mortality rate for the 80 hospitals represented in Figure 6 was 5.2 per 100 cases, or approximately 5 percent.
- Four hospitals had rates greater than two standard deviations above the hospital average.
- Five hospitals had risk-adjusted inpatient mortality rates significantly higher than the hospital average, and three had rates significantly lower than the average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 6. Congestive Heart Failure:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with principal diagnosis code for congestive heart failure)



Each data point represents the rate of a single hospital.

Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

STROKE – MORTALITY

Stroke is the third leading cause of death in the U.S. Each year over 750,000 people experience a stroke and over 20 percent of them die from a stroke. Many others experience permanent and serious disability. Incidence rates for stroke have decreased in recent decades due to better control of blood pressure and blood lipid levels, and to smoking cessation. Early treatment with clot-dissolving drugs and better management of stroke patients have also helped decrease stroke disability and mortality rates.

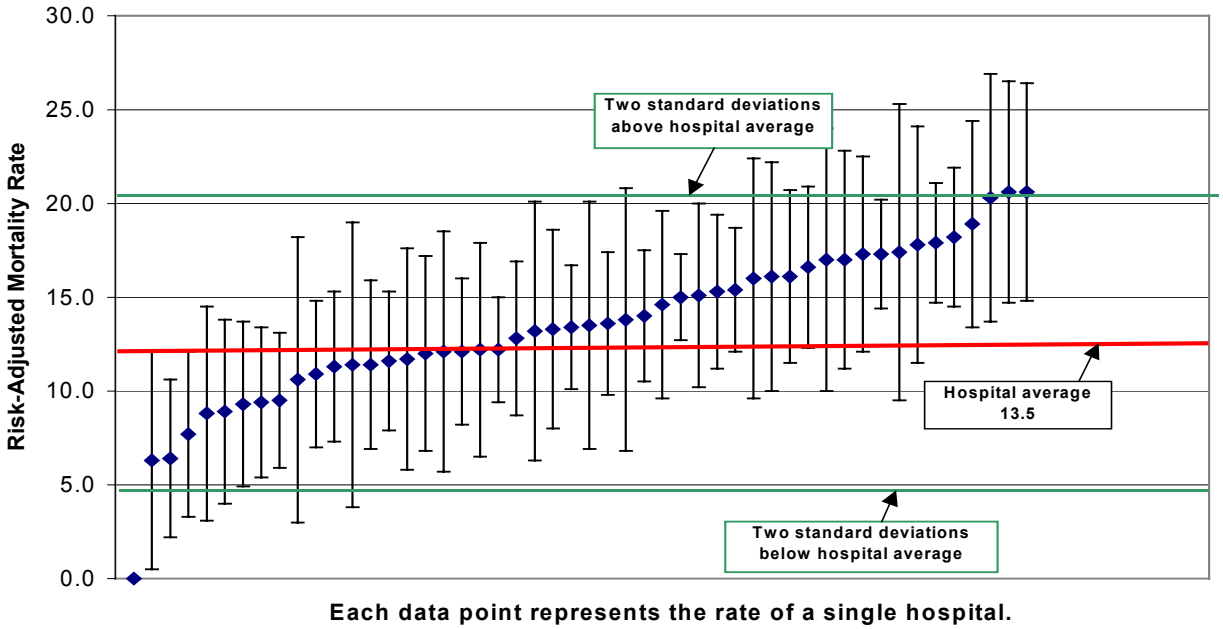
State-Level Inpatient Stroke Mortality

The statewide risk-adjusted inpatient mortality rate for persons hospitalized with stroke in 2001 was 13.6 per 100 cases.

Hospital-Level Inpatient Stroke Mortality (Figure 7)

- Risk-adjusted inpatient mortality rates for stroke ranged from 0 to 20.6 among the Wisconsin hospitals included in this report. (Rates for hospitals with fewer than 50 discharges associated with stroke in 2001 were excluded.)
- The average risk-adjusted, inpatient mortality rate for the included hospitals was 13.5 per 100 cases.
- Two hospitals had risk-adjusted rates greater than two standard deviations above the hospital average.
- Nine hospitals had risk-adjusted inpatient stroke mortality rates significantly higher than the hospital average, and one had a rate significantly lower than the average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 7. Acute Stroke:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with principal diagnosis code for stroke)



Each data point represents the rate of a single hospital.

Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

CAROTID ENDARTERECTOMY (CE) – VOLUME AND MORTALITY

People with moderate to severe narrowing in their carotid arteries are at risk for experiencing a stroke. Carotid arteries are blood vessels located in the neck that supply oxygen-rich blood from the heart to the brain. Carotid endarterectomy is a surgical procedure to remove fatty plaques from the carotid artery. Over 130,000 carotid endarterectomies are performed in the U.S. yearly. This operation is performed through an incision in the neck to expose the carotid artery. An incision is then made in the vessel wall and the fatty plaque is removed from the walls of the artery.

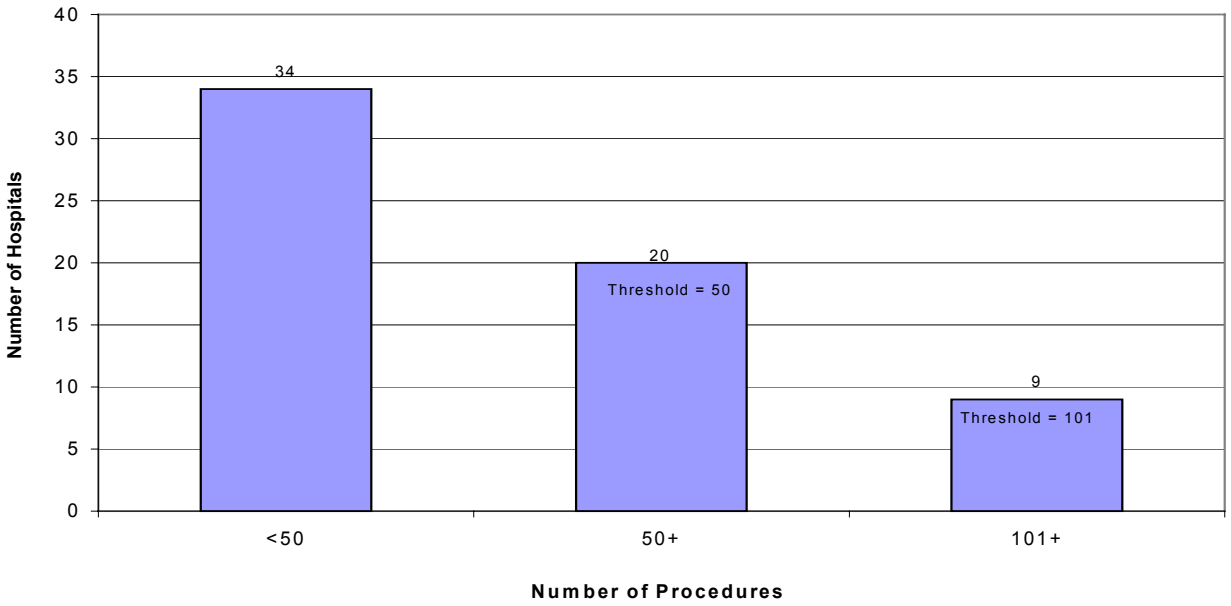
Carotid Endarterectomy Volume

AHRQ identified two high-volume thresholds for CE surgery—50 and 101 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Seventy-six percent of the CE surgeries done in Wisconsin in 2001 were performed at hospitals that met the high-volume threshold of 50 procedures. Fifty-two percent of surgeries were performed at hospitals that met the higher threshold of 101 procedures.

CE High-Volume Thresholds (Figure 8)

- Fifty-four Wisconsin hospitals performed CE surgeries in 2001.
- Twenty of 54 hospitals met the AHRQ volume threshold of 50 procedures.
- Nine of 54 hospitals met the AHRQ volume threshold of 101 procedures.

Figure 8. Carotid Endarterectomy: High-Volume Thresholds
Number of hospitals below and at/above high-volume thresholds



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

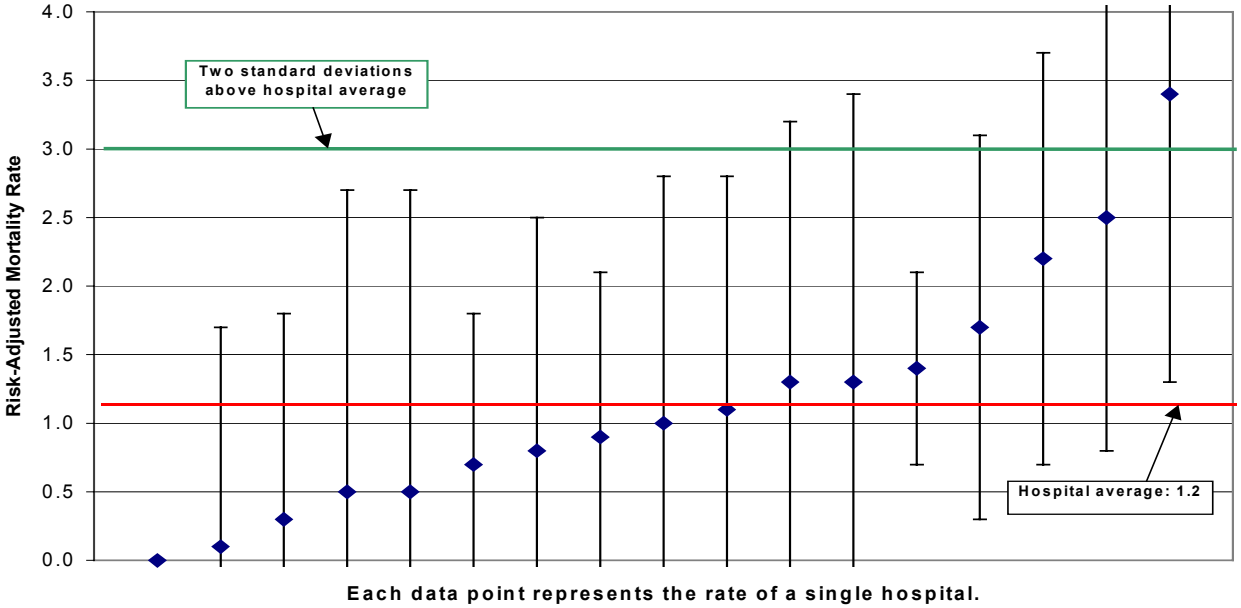
State-Level CE Mortality

The Wisconsin statewide risk-adjusted, inpatient mortality rate for CE surgery was 0.9, or approximately one death per 100 procedures.

Hospital-Level CE Mortality (Figure 9)

- Risk-adjusted inpatient mortality rates among the Wisconsin hospitals represented in this report ranged from 0 to 3.4 per 100. (Rates for hospital with fewer than 50 procedures in 2001 were excluded.)
- The average risk-adjusted inpatient CE mortality rate for the included hospitals was 1.2 per 100 procedures.
- One hospital's rate was greater than two standard deviations above the hospital average.
- The same hospital's rate was significantly higher than the average, based on a 95 percent confidence interval. Confidence interval width should be considered when interpreting this rate.

Figure 9. Carotid Endarterectomy:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with procedure code for carotid endarterectomy in any field)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

ABDOMINAL AORTIC ANEURYSM (AAA) REPAIR – VOLUME

An aneurysm occurs when there is a weakness in the wall of an artery. This often results in a bulging or enlargement of the artery that can leak or burst causing a rapid loss of blood. An AAA occurs in the abdominal area in the aorta – the main artery from the heart supplying the body with oxygen-rich blood. An estimated 5 to 7 percent of people over the age of 60 experience AAA. Men are affected four times as often as women. Large abdominal aortic aneurysms (more than 2 inches) must be repaired to prevent rupture of the artery. AAA surgery involves making a vertical incision in the midline of the abdomen, removing the damaged portion of the aorta and replacing it with a man-made graft. A newer, non-surgical procedure involving the placement of a stent in the affected area through a catheter in the groin area is available for many people.

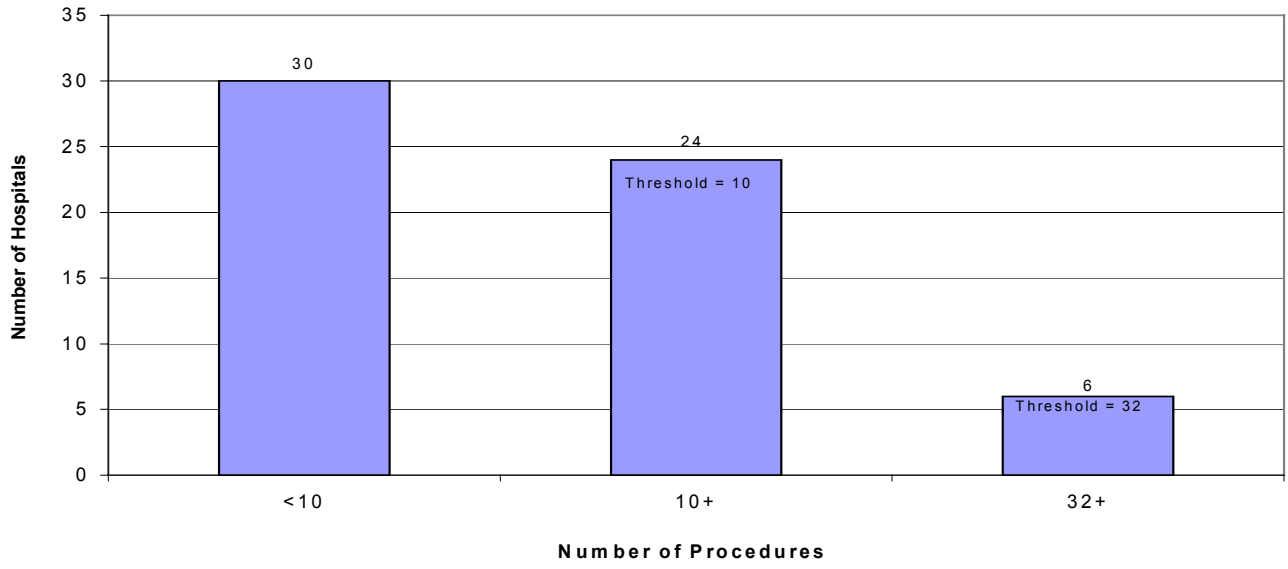
AAA Repair Volume

AHRQ identified two high-volume thresholds for AAA repair surgery—10 procedures and 32 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Eighty-three percent of AAA repair surgeries done in Wisconsin in 2001 were performed at hospitals meeting the high-volume threshold of 10 procedures; 53 percent were performed at hospitals meeting the higher threshold of 32 procedures.

AAA Repair High-Volume Thresholds (Figure 10)

- Forty-eight Wisconsin hospitals performed AAA repair surgeries in 2001.
- Twenty-four of 48 hospitals (50 percent) met the AHRQ volume threshold of 10 procedures.
- Six of 48 hospitals (12.5 percent) met the AHRQ volume threshold of 32 procedures.

Figure 10. Abdominal Aortic Aneurysm Repair: High-Volume Thresholds
Number of hospitals below and at/above high-volume thresholds



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Orthopedics

HIP FRACTURE – MORTALITY

The hip is the largest large ball-and-socket joint in the body. Every year, approximately 350,000 people experience a hip fracture in the U.S., and 90 percent are over 65 years of age. Women are two to three times as likely as men to sustain a hip fracture. With aging, bones lose their mineral content and become brittle, increasing the chances of hip fracture. Hip fractures are serious events in themselves and may be accompanied by complications such as significant blood loss and lung clots (pulmonary emboli).

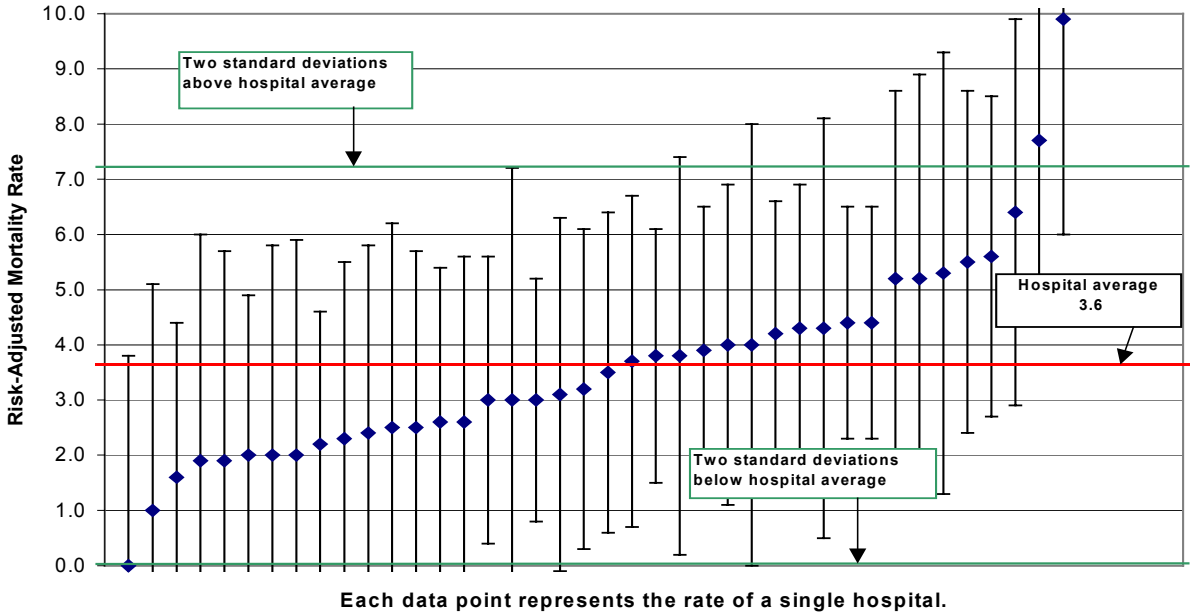
State-Level Hip Fracture Mortality

The Wisconsin statewide risk-adjusted inpatient mortality rate for hip fracture in 2001 was 3.5 per 100 hospitalized cases.

Hospital-Level Hip Fracture Mortality (Figure 11)

- Risk-adjusted mortality rates for hip fracture among the hospitals represented in Figure 11 ranged from 0 to 9.9 per 100 cases. (Rates for hospital with fewer than 50 discharges for hip fracture were excluded.)
- The average risk-adjusted hip-fracture mortality rate for the included hospitals was 3.6 per 100 cases.
- Two hospitals had rates greater than two standard deviations above the hospital average.
- The same two hospitals had risk-adjusted mortality rates significantly higher than the average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 11. Hip Fracture:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with principal diagnosis code for hip fracture)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

HIP REPLACEMENT – MORTALITY

Hip replacement is performed to repair a fractured hip or to prevent fracture in a hip joint damaged by arthritis, infection or problems with blood supply. Approximately 120,000 hip replacement surgeries are performed annually in the U.S. Hip replacement surgery involves the removal of diseased parts of the hip joint and replacement with artificial parts that include a socket anchored in the pelvis and a ball-type anchor placed in the thigh bone (femur).

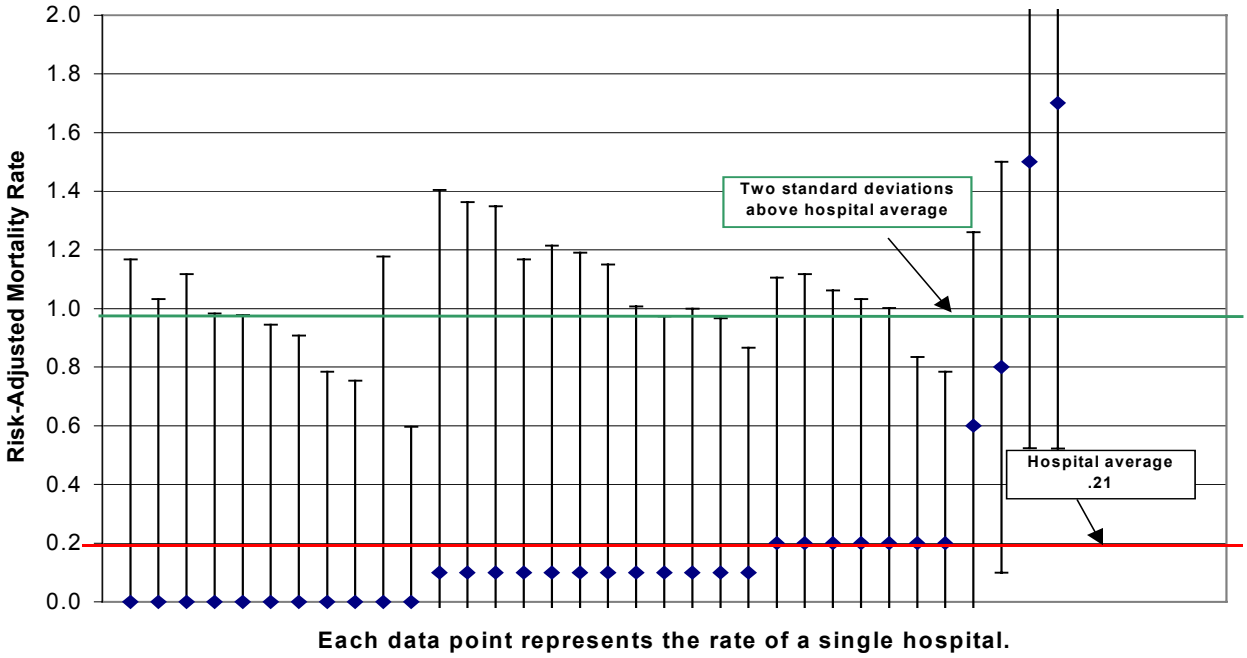
State-Level Hip Replacement Mortality

The Wisconsin statewide risk-adjusted mortality rate for hip replacement surgery in 2001 was 0.15, or less than one death per 100 procedures.

Hospital-Level Hip Replacement Mortality (Figure 12)

- Risk-adjusted mortality rates for hip replacement surgery at hospitals represented in this report ranged from 0 to 1.7 per 100 procedures. (Hospitals with fewer than 50 procedures in 2001 were excluded.)
- The average risk-adjusted mortality rate among hospitals included in this report was 0.21 deaths, or less than one per 100 procedures. Only two hospitals had risk-adjusted rates as high as one death per 100 procedures.
- Two hospitals had risk-adjusted rates greater than two standard deviations above the average.
- The same two hospitals had risk-adjusted mortality rates significantly higher than the hospital average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 12. Hip Replacement:
Risk-Adjusted Mortality Rates and 95% Confidence Intervals
(Number of deaths per 100 discharges with procedure code for partial or full hip replacement in any field)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

Cancer Surgery

ESOPHAGEAL RESECTION – VOLUME

Nearly 14,000 cases of cancer of the esophagus are diagnosed annually in the U.S. Men are three to five times more likely than women to develop esophageal cancer. Excessive alcohol consumption and tobacco use increase the likelihood of developing esophageal cancer. Five-year survival rates for esophageal cancer have increased three-fold in whites and nine-fold in African Americans, but five-year survival rates are still only 13 percent and 9 percent for whites and African Americans respectively. Early diagnosis and medical and surgical treatment have contributed to increased survival rates.

Esophageal resection is the most common treatment for cancer of the esophagus. This cancer surgery involves removing the diseased portion of the esophagus and reconnecting the remaining healthy portion of the esophagus to the stomach. A plastic tube or a part of the intestine may be used to make the connection.

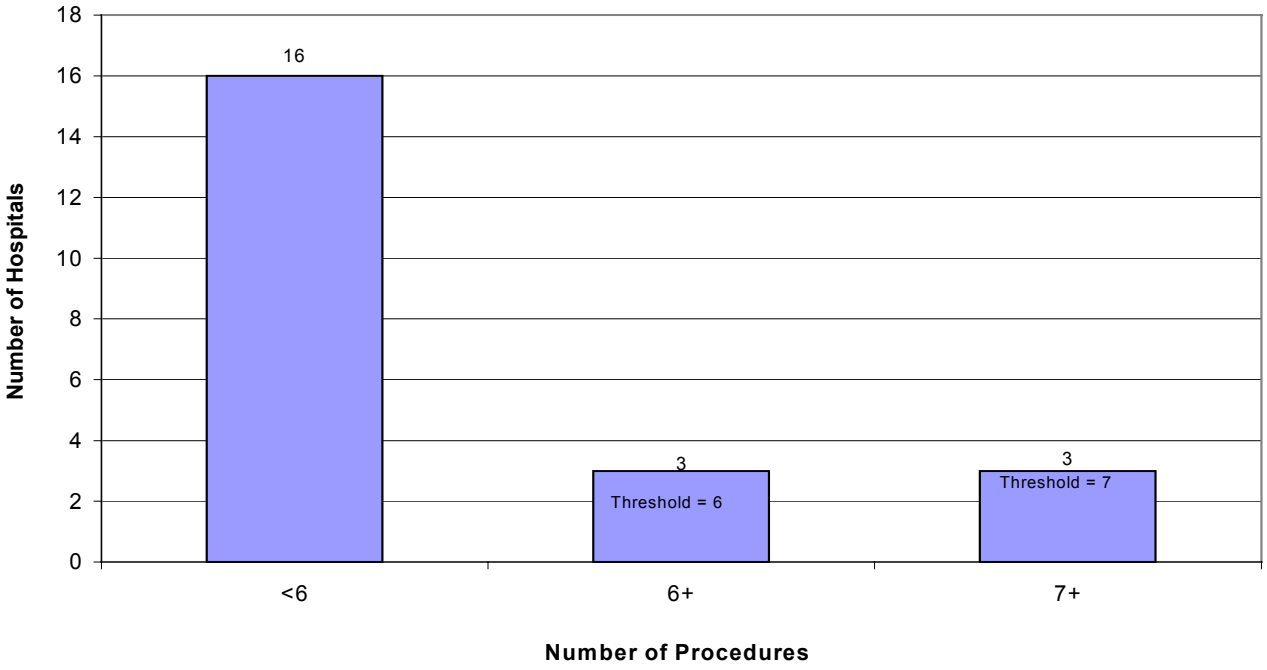
Esophageal Resection Volume

AHRQ identified two high-volume thresholds for esophageal resection surgery—6 and 7 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Twenty-three (or 44 percent) of the 52 esophageal resections done in Wisconsin in 2001 were performed at hospitals meeting the higher of the two high-volume thresholds identified by AHRQ (7 procedures annually). None met *only* the lower threshold of 6 procedures.

Esophageal Resection High-Volume Thresholds (Figure 13)

- Nineteen Wisconsin hospitals performed esophageal resection surgeries in 2001.
- Three hospitals performed seven or more procedures, the higher threshold identified by AHRQ.
- Most Wisconsin hospitals performing esophageal resections (16 hospitals) did not meet either high-volume threshold identified by AHRQ for this procedure.

Figure 13. Esophageal Resection:
High-Volume Thresholds
Number of hospitals below and at/above high-volume thresholds



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

PANCREATIC RESECTION – VOLUME

Pancreatic cancer accounts for 2 percent of all new cancers in the U.S., but 5 percent of cancer deaths. The pancreas is an important organ that produced insulin and many digestive enzymes. Since pancreatic cancer is often far advanced at the point of first diagnosis, mortality rates are high. Pancreatic resections are performed for both curative and palliative purposes.

Pancreatic resection is a complex surgery that involves the removal of either the entire pancreas or the diseased part of the pancreas, the first part of the small intestine known as the duodenum, the gallbladder and a portion of the common bile duct. Depending on the procedure required, the bile duct and portions of the stomach and spleen may be removed as well. Patients undergoing a pancreatic resection may need to take insulin and pancreatic enzyme supplements after the surgery.

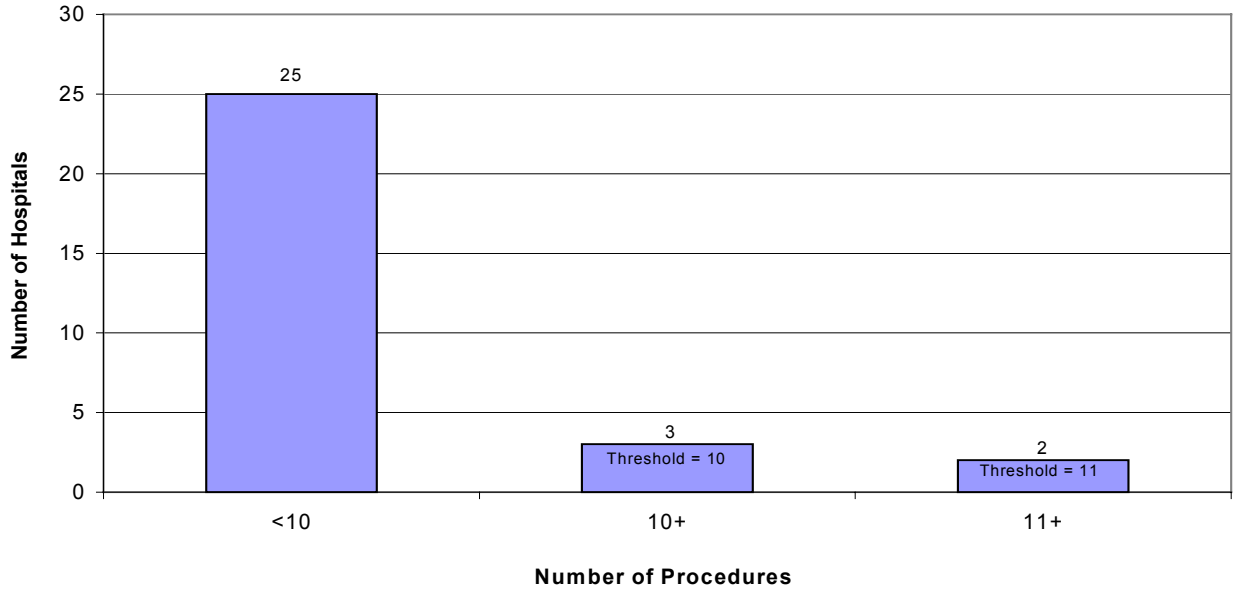
Pancreatic Resection Volume

AHRQ identified two high-volume thresholds for pancreatic resection surgery—10 and 11 procedures annually. The medical literature citations supporting these volume thresholds are shown in Appendix D. Thirty-seven percent of pancreatic resection surgeries in Wisconsin were performed at hospitals that met the high-volume threshold of 10 procedures, and 26 percent of pancreatic resections were performed at hospitals that met the high-volume threshold of 11 procedures.

Pancreatic Resection High-Volume Thresholds (Figure 14)

- Twenty-eight Wisconsin hospitals performed pancreatic resections in 2001.
- Three hospitals met the AHRQ high-volume threshold of ten procedures. Two of those hospitals also met the AHRQ high-volume threshold of 11 procedures.
- Most Wisconsin hospitals performing the procedure did not meet either high-volume threshold.

Figure 14. Pancreatic Resection:
High-Volume Thresholds
Number of hospitals below and at/above high-volume thresholds



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Women's Health

CESAREAN SECTION – Utilization

Cesarean section (C-section) is the surgical delivery of a baby through an incision in the mother's abdomen and uterus. C-sections are indicated when the baby or mother is in danger or distress. Some common examples of these situations are toxemia of pregnancy, infection, bleeding, failure of labor to progress normally and breech position. Many women with a previous C-Section will require or elect to have C-sections for subsequent births. Some health care experts believe that a significant percentage of C-sections are unnecessary. Wide variation in C-section rates has been observed across the United States. The current national C-section rate is approximately 24 percent.[7]

State-Level Cesarean Section Utilization

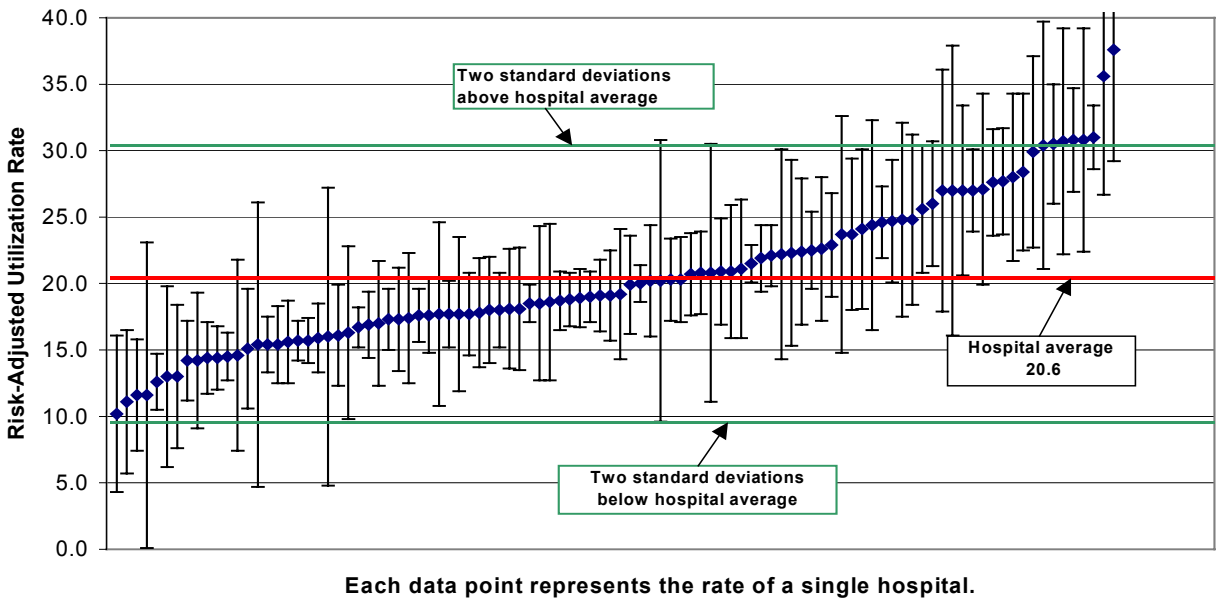
The Wisconsin statewide risk-adjusted Cesarean section rate in 2001 was 19 per 100 deliveries, or 19 percent. This is substantially lower than the national rate of 24 percent.

Hospital-Level Cesarean Section Utilization (Figure 15)

- The risk-adjusted C-section utilization rates among Wisconsin hospitals with at least 50 deliveries ranged from 10.2 to 37.6 per 100. (Hospitals with fewer than 50 deliveries were excluded.)
- The average risk-adjusted C-section rate for the hospitals included in Figure 15 was 20.6 per 100 deliveries.
- Five hospitals had rates greater than two standard deviations above the hospital average.
- Eighteen hospitals had risk-adjusted C-section rates significantly higher than the hospital average, and 25 hospitals had rates significantly *lower* than the hospital average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

[7] Centers for Disease Control and Prevention, U.S. Department of Health and Human Services, "Births: Preliminary Data for 2001."

Figure 15. Cesarean Section:
Risk-Adjusted Utilization Rates with 95% Confidence Intervals
(Number of Cesarean sections per 100 deliveries)



Each data point represents the rate of a single hospital.

Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

Hospitalizations for Acute Conditions

PNEUMONIA – MORTALITY

Pneumonia is a serious infection of the lungs. The lung's tiny air sacs (alveoli) become inflamed and filled with pus and fluid. Pneumonia is caused by many different kinds of bacteria, viruses and other organisms. Pneumonia accounts for 1.3 million hospitalizations and over 60,000 deaths annually in the U.S.

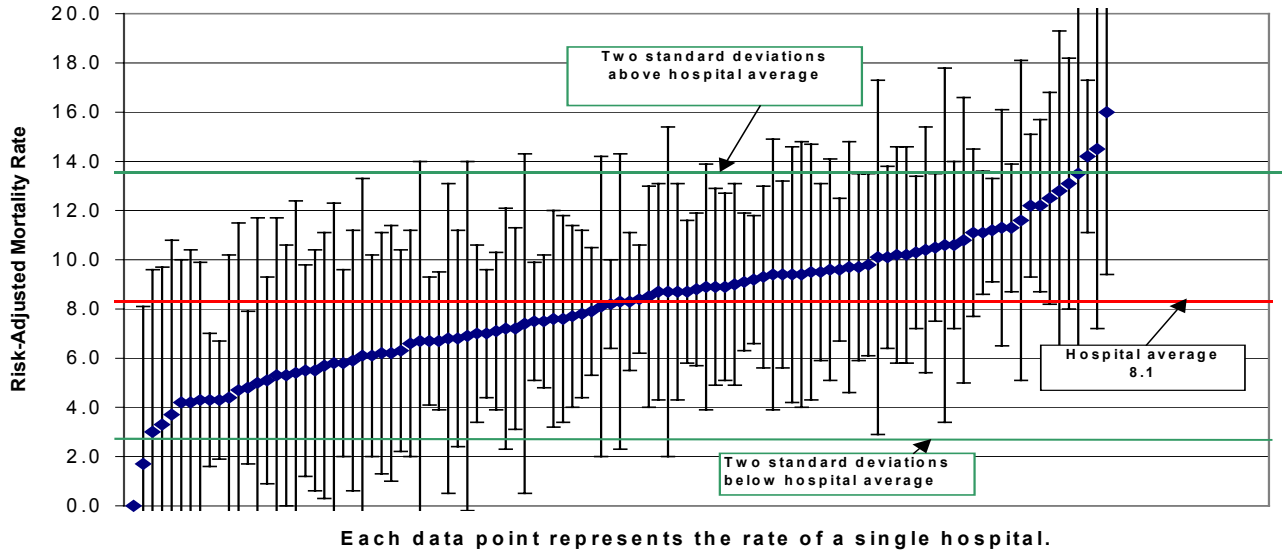
State-Level Pneumonia Mortality

The statewide risk-adjusted inpatient mortality rate for pneumonia was 8.4, or approximately 8 out of 100 hospitalized cases.

Hospital-Level Pneumonia Mortality (Figure 16)

- Risk-adjusted, inpatient mortality rates for pneumonia ranged from 0 to 16.0 among the Wisconsin hospitals represented in this report. (Hospitals with fewer than 50 pneumonia discharges in 2001 were excluded.)
- The average risk-adjusted inpatient mortality rate for pneumonia was 8.1 per 100 cases.
- Three hospitals had rates greater than two standard deviations above the hospital average.
- Seven hospitals had rates significantly higher than the average and five had rates significantly *lower* than the average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 16. Pneumonia:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with principal diagnosis code for pneumonia)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

GASTROINTESTINAL (GI) HEMORRHAGE – MORTALITY

Gastrointestinal (GI) bleeding ranges from a microscopic loss of blood to life threatening hemorrhage. Bleeding can occur at any point in the GI tract. There are many causes of GI bleeding including ulcers, inflammation, infection, cancer, and abnormal blood vessel formations.

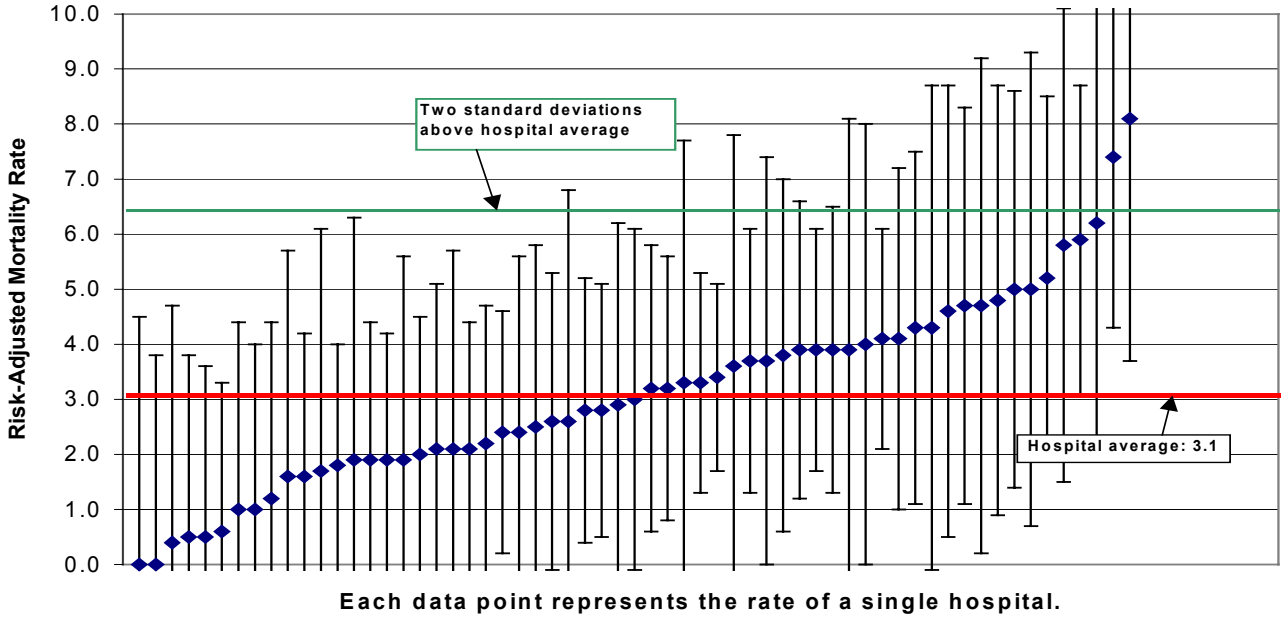
State-Level GI Hemorrhage Mortality

The statewide risk-adjusted inpatient mortality rate for persons hospitalized with GI hemorrhage in 2001 was 3.0 per 100 cases.

Hospital-Level GI Hemorrhage Mortality (Figure 17)

- Risk-adjusted inpatient mortality rates for GI hemorrhage ranged from 0 to 8.1 among Wisconsin hospitals included in this report. (Hospitals with fewer than 50 GI hemorrhage discharges in 2001 were excluded.)
- The average risk-adjusted inpatient mortality rate for GI hemorrhage was 3.1 per 100 cases.
- Two hospitals had inpatient mortality rates greater than two standard deviations above the hospital average.
- The same two hospitals had rates significantly higher than the average, based on 95 percent confidence intervals. Confidence interval widths should be considered when interpreting these rates.

Figure 17. Gastrointestinal Hemorrhage:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with principal diagnosis code of gastrointestinal hemorrhage)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

Other

CRANIOTOMY – MORTALITY

Craniotomy refers to any surgery that involves surgically entering the cranium or skull for therapeutic purposes. This indicator includes a very broad range of procedures associated with diverse diagnoses. Craniotomy or "brain surgery" may be performed for benign or cancerous tumors, bleeding, vascular abnormalities, severe seizure disorders, brain abscesses and other conditions such as Parkinson's disease.

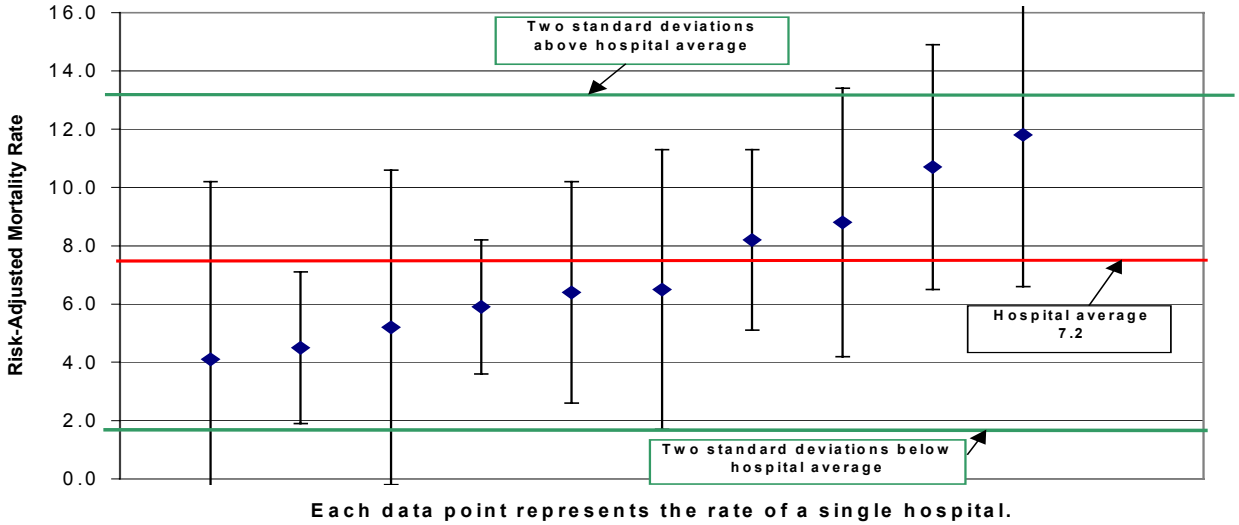
State-Level Craniotomy Mortality

The statewide risk-adjusted inpatient mortality rate for craniotomy in 2001 was 7.0 per 100 procedures.

Hospital-Level Craniotomy Mortality (Figure 18)

- Inpatient mortality rates for craniotomy among the 10 hospitals represented in Figure 18 ranged from 4.1 to 11.8 per 100 procedures. (Hospitals with fewer than 50 procedures in 2001 were excluded.)
- The average risk-adjusted craniotomy mortality rate was 7.2 per 100 procedures.
- Rates for all included hospitals were within 2 standard deviations of the hospital average.
- One hospital's rate was significantly lower than the average, based on a 95 percent confidence interval. Confidence interval width should be considered when interpreting this rate.

Figure 18. Craniotomy:
Risk-Adjusted Mortality Rates with 95% Confidence Intervals
(Number of deaths per 100 discharges with procedure code for craniotomy in any field)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

INCIDENTAL APPENDECTOMY AMONG THE ELDERLY – UTILIZATION

Elderly persons undergo abdominal surgery for a wide variety of conditions. Performing an incidental appendectomy during these surgeries is rarely indicated.

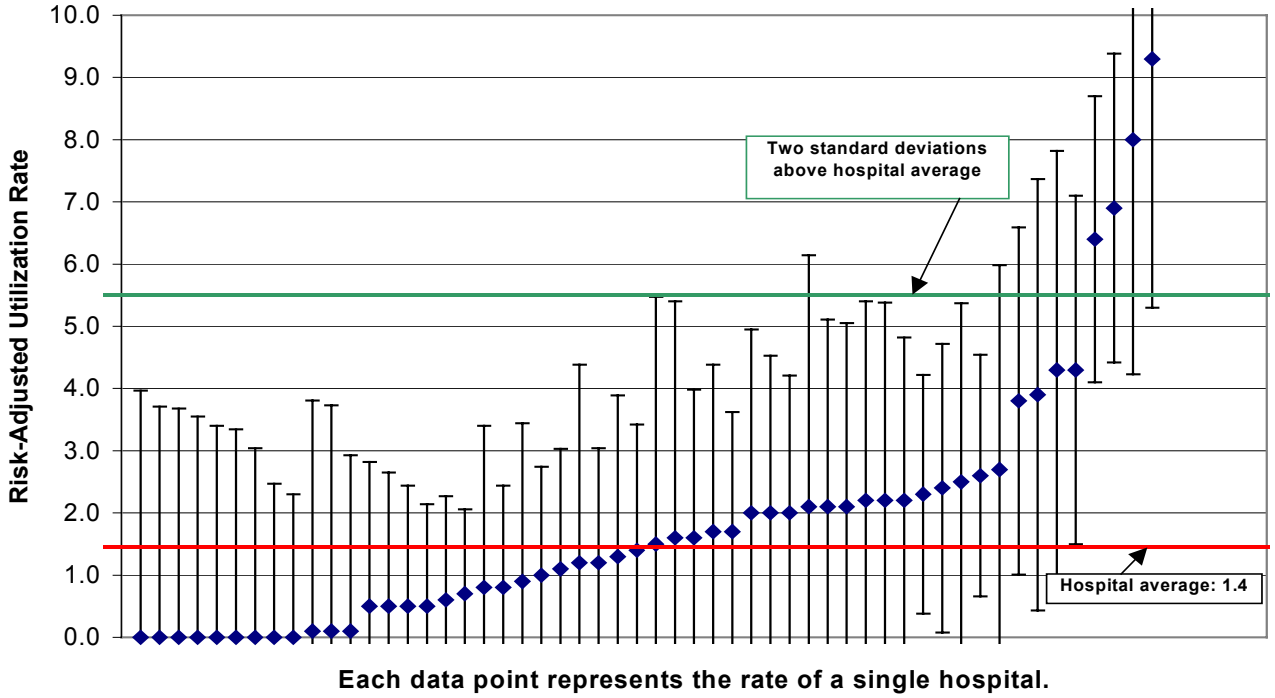
State-Level Incidental Appendectomy

The statewide utilization rate for incidental appendectomy (elderly) in 2001 was 1.7 per 100 intra-abdominal procedures.

Hospital-Level Incidental Appendectomy Utilization (Figure 19)

- Risk-adjusted incidental appendectomy utilization rates ranged from 0 to 9.1 per 100 procedures among the hospital represented in this report. (Hospitals with fewer than 50 intra-abdominal procedures performed on elderly patients in 2001 were excluded.)
- The average risk-adjusted rate was 1.4 per 100 procedures.
- Four hospitals had utilization rates greater than two standard deviations above the average.
- Five hospitals had utilization rates significantly higher than the average, based on 95 percent confidence intervals.

Figure 19. Incidental Appendectomy:
Risk-Adjusted Utilization Rates with 95% Confidence Intervals
(Number of incidental appendectomies per 100 elderly discharges with intra-abdominal procedure)



Source: 2001 Wisconsin Inpatient Discharge Data, Bureau of Health Information, Division of Health Care Financing, Department of Health and Family Services.

Note: Values for hospitals with fewer than 50 cases are excluded.

Summary and Conclusions

This report presents a "snapshot" of the general performance of Wisconsin hospitals across a number of inpatient quality indicator areas. The results are only descriptive, not conclusive, owing to such drawbacks as the limitations of billing data, small numbers of procedures in many hospitals, and the prohibition against identification of hospitals. In spite of these drawbacks, a few things appear likely based on the results.

First, we noted earlier that the literature identified by AHRQ suggests a relationship between procedure volume and outcome, specifically that higher volumes are associated with better outcomes. While such a relationship makes sense on an intuitive level, we did not find it to be the case among Wisconsin hospitals. We computed average risk-adjusted mortality rates for groups of hospitals based on the volume thresholds identified by AHRQ and found no significant differences between high-volume and low-volume hospitals. That said, the unreliability of rates calculated for hospitals with small numbers of cases presents a built-in limitation for the testing of a volume-outcome relationship. The results should thus be viewed as suggestive rather than conclusive in that regard.

Second, for most of the indicators presented, overall variation is not extreme among hospitals with sufficient numbers of cases for the computation of reliable rates (mortality and utilization). A few apparent high outliers do exist for various indicators, however, and we plan to notify these hospitals privately in order to assist in their ongoing quality improvement efforts. Moreover, although we are prohibited from naming hospitals in this report, we can state with assurance that in no instance was any hospital a high outlier on more than one indicator.

It is important to reiterate that the indicator results in this report reflect only one-year of hospital "performance," thus they cannot be taken as suggestive of entrenched patterns. Random variation could produce "blips" in any given year for otherwise well-performing hospitals. Subsequent reports involving multiple years of data may convey more information about true systematic differences in hospital performance quality.

Appendix A
Quality Indicators Workgroup

The Bureau of Health Information, Department of Health and Family Services, and the Board on Health Care Information wish to thank the members of the Quality Indicators Workgroup for sharing their time, expertise and advice concerning the development and presentation of this report.

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Appendix B
Healthcare Cost and Utilization Project (HCUP)

The Agency for Healthcare Research and Quality (AHRQ) is the lead federal agency for producing information about health care quality. AHRQ has been charged by the U.S. Congress to produce the first National Healthcare Quality Report in 2003. Some of the information in the national report will come from the hospital discharge database maintained by AHRQ.

Thirty-one states submit clinical, utilization and demographic information on inpatient hospital stays to AHRQ. This uniform database is the foundation of the Healthcare Cost and Utilization Project (HCUP). HCUP is a public partnership of states, hospitals and the federal government intended to provide comparative information about specific aspects of health care. Wisconsin began participating in the HCUP project in 1992. A set of 33 HCUP Quality Indicators (HCUP QIs) was developed in the early 1990s in response to requests from state-level organizations and hospital associations with inpatient data collection systems.

Since the development of the original HCUP QIs, better methods for assessing quality of care have evolved. For example, improved models for risk adjustment have been developed. As a result, AHRQ funded the University of California San Francisco-Stanford Evidence-Based Practice Center (UCSF-Stanford EPC) to refine and further develop the original HCUP QIs. Using the Institute of Medicine's widely cited definition of quality[8] the UCSF-Stanford EPC was guided by six key research questions:

1. Which quality indicators currently in use or described in the existing literature could be defined using existing hospital discharge data?

2. What quality relationships, identified by current research, could help identify new indicators using hospital discharge data?

3. What evidence exists for indicators not well represented in the original indicators – pediatric conditions, chronic disease, new technologies, and ambulatory- care-sensitive conditions?

4. Which quality indicators have literature-based evidence to support face validity, precision of measurement, minimum bias, and construct validity of the indicator?

5. What risk-adjustment method should be suggested for use with the recommended indicators, given the limits of administrative data and other practical concerns?

6. Which indicators perform well on empirical tests of precision of measurement, minimum bias, and construct validity?

[8] "The degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge." (Institute of Medicine Division of Health Services. Medicare: a strategy for quality assurance. Washington, DC: National Academy Press; 1990.

7. The UCSF-Stanford EPC analyses resulted in the development of three types of indicators based on administrative hospital discharge data:

   - **Preventive Care Indicators** provide insight into care delivered in an outpatient setting.
   - **Patient Safety Indicators** provide information about medical errors occurring during a hospital stay.
   - Hospital **Inpatient Quality Indicators** provide information about procedure volume, patterns of utilization and mortality associated with common conditions and procedures.

Appendix C
Procedure and Diagnosis Codes Associated with the AHRQ Inpatient Quality Indicators Used in this Report*

Volume/Mortality for Procedures:

- **Esophageal Resection Volume**

Procedure codes:	Esophageal cancer diagnosis codes:
4240, 4241, 4242	1500-1505, 1508, 1509

- **Pancreatic Resection Volume**

Procedure codes:	Pancreatic cancer diagnosis codes:
526, 527	1520, 1561, 1562, 1571-1574, 1578, 1579

- **Abdominal Aortic Aneurysm Repair Volume/Mortality**

Procedure codes:	AAA diagnosis codes:
3834, 3844, 3864	4413, 4414

- **Coronary Artery Bypass Graft (CABG) Volume/Mortality**

  Procedure codes:

  3610-3617, 3619

- **Percutaneous Transluminal Coronary Angioplasty (PTCA) Volume**

  Procedure codes:

  3601, 3602, 3605, 3606

- **Carotid Endarterectomy Volume/Mortality**

  Procedure codes:

  3812

* The codes listed are ICD-9-CM unless otherwise noted.

- **Craniotomy Mortality**

  Procedure codes:

  DRG 001 – craniotomy (ICD-9-CM procedure codes not provided by AHRQ)

- **Hip Replacement Mortality**

  Procedure codes:

  8151-8153

  Osteoarthritis diagnosis codes:

  71500, 71509, 71510, 71515, 1518, 71520, 71525, 71528, 71530, 71535, 71538, 71580, 71589, 71590, 71595, 71598,71650, 71655, 71658-71660, 71665, 71668, 71669, 71690, 71695, 71698, 71699

Mortality for Conditions:

- **Acute Myocardial Infarction (AMI) Mortality**

  Diagnosis codes:

  41001, 41011, 41021, 41031, 41041, 41051, 41061, 41071, 41081, 41091

- **Congestive Heart Failure Mortality**

  Diagnosis codes (excludes cases with cardiac procedure code in any field):

  39891, 40201, 40211, 40291, 40401, 40403, 40411, 40413, 40491, 40493, 4280, 4281, 4289

- **Acute Stroke Mortality**

  Diagnosis codes:

  43301, 43311, 43321, 43331, 43381, 43391, 43401, 43411, 43491, 4320, 4321, 4329, 436, 430, 431

- **Gastrointestinal Hemorrhage Mortality**

  Diagnosis codes:

  53082, 53100, 53101, 53120, 53121, 52140, 53141, 53160, 53161, 53200, 53201 53220, 53221, 53240, 53241, 53260, 53261, 53300, 53301, 53320, 53321, 53340 53341, 53360, 53361, 53400, 53401, 53420, 53421, 53440, 53441, 53460, 53461 53501, 53511, 53521,

53531, 53541, 53551, 53561, 53783, 56202, 56203, 56212 56213, 56985, 4560, 5307, 5693, 5780, 5781, 5789

- **Hip Fracture Mortality**

  Diagnosis codes:

  82000, 82001-82003, 82009-82013, 82019-82022, 82030-82032, 8208, 8209

- **Pneumonia Mortality**

  Diagnosis codes:

  00322, 11505, 11515, 11595, 48230-48232, 48239, 48240, 48241,48249, 48281-48284, 48289, 4829-4831, 4838, 4841, 4843, 4845-4848, 481,485, 486, 5070, 5100, 5109, 5110, 5130, 0212, 0391, 0521, 0551, 0730, 1124, 1140,1144, 1145, 1304, 1363, 4800-4802, 4808, 4809, 4820-4822, 4824

Utilization:

- **Cesarean Section Delivery**

  Numerator:
  Cesarean section delivery DRGs: 370-371

  Denominator:
  All delivery DRGs: 370-375

- **Incidental Appendectomy Among the Elderly**

  Numerator:
  ICD-9-CM procedure codes:

  471, 4711, 4710

  Denominator:
  Intra-abdominal procedure DRGs:

  146-155, 170, 171, 191-198, 201, 354-359, 365

Appendix D
References Cited by AHRQ for Procedure High-Volume Thresholds

- **Esophageal Resection**

  Threshold 1 (6): Patti, M.G., et al. 1998. "A hospital's annual rate of esophagectomy influences the operative mortality rate." *Journal of Gastrointestinal Surgery* 2(2): 186-192.

  Threshold 2 (7): Dudley, R.A., et al. 2000. "Selective referral to high-volume hospitals: estimating potentially avoidable deaths." *JAMA* 283(9): 1159-1166.

- **Pancreatic Resection**

  Threshold 1 (10): Glasgow, R.D. and S.J. Mulvhill. 1996. "Hospital volume influences outcome in patients undergoing pancreatic resection for cancer." *Western Journal of Medicine* 165(5): 294-300.

  Threshold 2 (11): Glasgow, R.D. and S.J. Mulvhill. 1996.

- **Abdominal Aortic Aneurysm Repair**

  Threshold 1 (10): Hannan, E.L., et al. 1998. "A longitudinal analysis of the relationship between in-hospital mortality in New York State and the volume of abdominal aortic aneurysm surgeries performed." *Health Services Research* 27(4): 517-542.

  Threshold 2 (32): Kazmers, A., et al. 1996. "Abdominal aortic aneurysm repair in Veterans Affairs medical centers." *Journal of Vascular Surgery* 23(2): 191-200.

- **Coronary Artery Bypass Graft (CABG)**

  Threshold 1 (100): Eagle, K.A., et al. 1999. "Guidelines for coronary artery bypass graft surgery: A report of the American College of Cardiology/ American Heart Association Task Force on Practice Guidelines (Committee to revise the 1991 guidelines for coronary artery bypass graft surgery)." *Journal of the American College of Cardiology* 34(4): 1262-1347.

  Threshold 2 (200): Hannan, E.L., et al. 1991. "Coronary artery bypass surgery: the relationship between in-hospital mortality rate and surgical volume after controlling for clinical risk factors." *Medical Care* 29 (11): 1094-1107.

- **Percutaneous Transluminal Coronary Angioplasty (PTCA)**

  Threshold 1 (200): Ryan, T.J. 1993. "Guidelines for percutaneous transluminal coronary angioplasty: A report of the American Heart Association/American College of Cardiology Task Force on Assessment of Diagnostic and Therapeutic Cardiovascular Procedures

(Committee on Percutaneous Transluminal Coronary Angioplasty)." *Circulation* 88(6):2987-3007.

Threshold 2 (400): Hannan, E.L., et al. 1997. "Coronary angioplasty volume-outcome relationships for hospitals and cardiologists." *JAMA* 227(11): 892-898.

- ## Carotid Endarterectomy

Threshold 1 (50): Manheim, L.M., et al. 1998. "Hospital vascular surgery volume and procedure mortality rates in California." *Journal of Vascular Surgery* 28(1): 45-46.

Threshold 2 (101): Dudley, R.A., et al. 2000. "Selective referral to high-volume hospitals: Estimating potentially avoidable deaths." *JAMA* 283(9): 1159-1166.

Hannan, E.L., et al. 1998. "Relationship between provider volume and mortality for carotid endarterectomies in New York State." *Stroke* 29(11): 2292-2297.

Appendix E
Risk Adjustment

Risk adjustment addresses the concern that systematic differences in case mix severity among hospitals potentially bias outcome measures such as mortality following surgical procedures. Risk adjustment systems typically use multivariate regression to adjust expected hospital performance based on patient characteristics.

A risk-adjusted rate (in this case a mortality or utilization rate) is a modification of the unadjusted rate, and is the rate that would be expected if the hospital had an "average" case mix. The average case mix is estimated using data from the 30 State Inpatient Databases (SIDs) compiled by the Agency for Health Research and Quality (AHRQ). In effect, risk adjustment standardizes rates, making it possible to compare hospitals with dissimilar case mixes. In addition, if the risk-adjusted value of an indicator for a hospital differs from the unadjusted value, it suggests that the hospital's case mix is more severe, or less severe, than average. Comparisons of a hospital's adjusted and unadjusted rates can be used to evaluate the impact of measured case mix characteristics on hospital performance.

AHRQ recommends using *3-M*'s APR-DRG (All Patient Refined Diagnosis Related Groups) risk adjustment system for use with its inpatient hospital quality indicators.

The APR-DRGs are an expansion of DRGs, a patient classification system used by the Centers for Medicare and Medicaid Services to relate hospital case mix to cost, or hospital resources consumed. The APR-DRGs were developed in response to the demand for a patient classification system with applicability beyond assessments of resource use – one which can be used to evaluate differences in outcomes such as inpatient mortality.

APR-DRGs expand basic DRGs through the addition of four subclasses which address distinct patient attributes related to severity of illness and risk of mortality.

Severity of illness denotes the extent of physiologic de-compensation or organ-system loss of function experienced by the patient, while risk of mortality refers to the likelihood of dying. The four severity-of-illness subclasses and four risk-of-mortality subclasses denote minor, moderate, major and extreme severity of illness and risk of mortality. Patients with the highest severity of illness and/or risk of mortality are characterized by the presence of multiple serious diseases.[9]

Assignment to APR-DRG severity-of-illness and risk-of-mortality subclasses takes into consideration principal diagnosis, secondary diagnoses and their combinations (co-morbidities), patient age and sex, and the presence of certain OR (operating room) and non-OR procedures.

The *3-M* Core Grouping Software uses patient attributes to calculate a severity-of-illness score and a risk-of-mortality score for each relevant patient data record in a hospital inpatient data file. These scores are added to the record and are used as variables in the calculation of risk-adjusted mortality and utilization rates for hospitals.

[9] Averill, R.F., et al. 1997. "Development of the All Patient Refined DRGs (APR-DRGs)." *3-M* Health Information Systems Research Report.

Appendix F
Technical Notes and Methodology

Data

This report uses data from the Wisconsin inpatient discharge data file, an administrative data set constructed using data submitted by hospitals to the state Bureau of Health Information. By state statute, all acute care, non-federal hospitals have been required to submit inpatient data to the state on a quarterly basis. In addition to charge and payer data, each record contains primary and secondary diagnoses and procedures, and information about the patient's age, gender, admission and discharge status. The Bureau of Health Information edits the data for errors and gives hospitals the opportunity to review and correct mistakes before releasing final data sets.

The inpatient discharge data file is a public use data set from which individual patient identifiers and physician names have been removed to preserve confidentiality.

The data used in this report refer only to care provided in Wisconsin hospitals during calendar year 2001.

Methods

AHRQ provides downloadable software and documentation for use in computing its hospital quality indicators from administrative data. The results displayed in this report were produced using the SAS programming language version of AHRQ's Inpatient Quality Indicators software. The indicator production process consists of several steps outlined below.

1. Format inpatient data.

   The AHRQ software uses a subset of data elements commonly included in administrative inpatient data files (see "Data," above). Since such files vary slightly from state to state in the formatting of data, the AHRQ software documentation provides necessary format specifications for each element to be used in producing the indicators. In the present case, some initial re-formatting of data was done, and hospital location codes (FIPS codes[*]) were added, to bring all the required data elements into conformity with AHRQ's specifications.

2. Use AHRQ software to search inpatient data file for relevant cases.

   The AHRQ inpatient indicators software contains several program files that perform different functions. The first program file searches the administrative (inpatient) data set for cases with diagnosis and procedure codes that match those associated with the volume, mortality and utilization indicators, and creates a new data file which is used by subsequent program files to produce the indicator values.

[*] Federal Information Processing Standards codes

3. Produce volume indicators.

   Indicators are produced in sequence, starting with volume indicators. Volume indicators are simple counts of the number of procedures associated with each hospital and all procedures are counted regardless of ultimate discharge status. Later, in the calculation of mortality rates, discharge status is a factor, and cases involving transfers to other inpatient facilities are excluded.

4. Risk-adjust data (applying *3-M* Core Grouping software) prior to calculation of mortality and utilization rates.

   3-M Core Grouping (APR-DRG) software, obtained for this report directly from *3-M*'s Health Information Systems Division, creates two additional data elements for each record denoting *severity of illness* and *risk of mortality*. These data elements are required for the calculation of risk-adjusted rates. For more information about risk adjustment, see Appendix E.

5. Calculate mortality and utilization rates, unadjusted and risk-adjusted.

   The AHRQ software produces unadjusted and risk-adjusted mortality and utilization rates for each hospital. A state-level rate (i.e., a rate for the state as a whole) is also produced for each indicator.

Appendix G
Complete List of AHRQ Inpatient Quality Indicators

Volume

Esophageal Resection
Pancreatic Resection
Pediatric Heart Surgery
AAA Repair
CABG
PTCA
Carotid Endarterectomy

Mortality--Procedures

Esophageal Resection
Pancreatic Resection
Pediatric Heart Surgery
AAA Repair
CABG
PTCA
Carotid Endarterectomy
Craniotomy
Hip Replacement

Mortality--Conditions

Acute Myocardial Infarction
Congestive Heart Failure
Stroke
GI Hemorrhage
Hip Fracture
Pneumonia

Utilization--Hospital Level

Cesarean Section
VBAC
Laparoscopic Cholecystectomy
Incidental Appendectomy (Elderly)
Laminectomy

Utilization--Area Level

CABG
PTCA
Hysterectomy
Laminectomy

Appendix H
Glossary of Terms

Confidence interval: the amount of error in either direction (+/-) associated with an estimate or value – for example: a rate. Rates calculated from small numbers of cases are subject to a large amount of error and have wide confidence intervals that reflect the lack of precision. Rates based on large numbers of cases are subject to less error and have correspondingly narrower confidence intervals. Stated differently, confidence intervals show the *range* of values (or rates) within which one can be confident that the true value lies. A 95 percent confidence interval shows the range of values that would contain the true value 95 out of 100 times. In this report, we show rates only for hospitals with *a minimum* of 50 cases of a procedure or condition; however, *rates calculated with 50-100 cases should be interpreted with caution* as well. (Such rates will appear with wide confidence intervals. See above.)

In this report, 95 percent confidence intervals also illustrate the statistical significance of the difference between two rates. In the figures, if the broken red line for the statewide rate passes through the confidence interval for a hospital's rate, it suggests that the difference between the two rates is not statistically significant. However, if the statewide rate is completely *outside* the confidence interval for a hospital, it suggests that the hospital's rate may be significantly higher or lower than the statewide rate.

Error associated with rates: the possibility that the true value of the rate is larger or smaller than the one calculated and shown. Rates calculated with small numbers of cases are subject to large potential error (see Confidence Interval).

High-volume threshold: the number of procedures performed annually that defines hospitals as high-volume for that procedure. For example, if a high-volume threshold for CABG surgery is 100, hospitals performing 100 or more CABG surgeries annually are considered high-volume for that procedure.

Hospital average rate: the sum of individual hospital rates divided by the number of hospitals.

Risk-adjusted rate: a modification of the unadjusted rate that takes into account a hospital's case mix severity. It can be thought of as the rate that would be expected if the hospital had an "average" case mix. Generally, a risk-adjusted rate lower than the unadjusted rate suggests that case mix severity is greater than average. A risk-adjusted rate higher than the unadjusted rate suggests that the case mix is less severe than average.

Risk of mortality: the likelihood of dying.

Statewide rate: the total number of events (e.g., in-hospital deaths associated with a given procedure) in Wisconsin, irrespective of hospital, divided by the total number of procedures where the event could have occurred. Example: the statewide rate for CABG mortality is the total number of in-hospital deaths, statewide, associated with CABG surgery divided by the total number of CABG surgeries (statewide).

Unadjusted rate: a simple proportion with no adjustment for case mix severity.

Examples:

1. The unadjusted mortality rate is the number of in-hospital deaths, as indicated by discharge status, divided by: 1) the total number of specified procedures, ***or*** 2) the total number of discharges for a specified condition.

2. The unadjusted utilization rate is the number of procedures divided by the total number of discharges where the procedure could have been performed. For example, the Cesarean section utilization rate is the number of C-sections divided by the total number of deliveries.

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